Pit and Quarry
With which is consolidated CEMENT-MILL & QUARRY
Member Audit Bureau of Circulations
Read in Largest Number of Plants
Vol. XX CHICAGO, APRIL 23, 1930 No. 2

Definite Program of Construction Urged

LEADERS OF INDUSTRY GATHER

The organization of a definite program for the development of building, representing all the varied interests in the construction industry, will be undertaken by the National Building Survey Conference as the result of a meeting held March 27 at Chicago.

It was decided that this organization should be so constituted that it would be representative of all the varying interests within the sphere of construction and building. The personnel of this committee in addition to Mr. Turck, chairman, consists of Dr. Wilson Compton, Secretary-Manager, The National Lumber Manufacturers' Association; Ernest A. Hale, President, United States League of Building and Loan Associations; Leonard Reaume, President, National Association of Real Estate Boards; Benjamin Affleck, President, Universal Atlas Cement Co.; and William C. Cox, of the American Face Brick Association. This committee was empowered to select a larger committee from the building industry which would draft recommendations for action to be taken by the entire building industry. It was tentatively decided to request this latter committee to report back to the Chamber of Commerce of the United States.

Start Sand Production in Wabash River Plant

Affolder Brothers, of Berne, Ind., have opened a new plant on the Wabash River, near Ceylon, Ind., for the production of river sand. Operations began early this month.

International Road Meet at Capital in October

The Permanent International Association of Road Congresses will be held at Washington, D. C., in October, according to announcements recently released by the American Road Builders Association. This is the first time the Association has met in the United States, and the gathering will continue its studies begun in Paris in 1908 and continued in Brussels in 1910, in London in 1913, in Seville in 1923 and in Milan in 1926.

The Congress will open on October 6 and will close October 11. One of the features will be the international road exhibition.

Southern Lime Products Opens 2,500-Ton Plant

The Southern Lime Products Co., of Cordele, Ga., has completed construction of its new crushing plant and operations began on April 15. The capacity of the new plant is 2,500 tons per ten-hour day. W. E. Harris of the Chas. C. Steward Machine Co., Birmingham, Ala., designed the new layout, which includes a Williams hammermill driven by a 250-hp. General Electric motor and a Link-Belt belt conveyor, among other equipment.

New Asbestos Operation Started During April

The new asbestos mine and plant of the Asbestos-Talc Products Co. of Washington, Inc., located near Burlington, Wash., is beginning actual operations this month and first shipments are to be made in May, according to press reports quoting C. R. Buck, general manager of the company.

Production will be at the rate of 50 tons per day, it is reported. The company owns 130 acres of deposits and plant equipment valued at $15,000.

Fire Destroys Kentucky Crushing-Plant Building

The large building housing the rock-crushing equipment and the electric motors at the plant of the Paris rock quarry at Paris, Ky., was destroyed by fire recently, with an estimated loss of $10,000. An explosion preceded the fire, but the exact nature of the origin of the blaze was undetermined.

Producers in Illinois Protest Prison Plan

UNFAIR COMPETITION CLAIMED

Illinois producers of crushed stone, sand and gravel have filed protests with Gov. L. L. Emmerson, who recently announced plans for the state to spend $105,000 at the Joliet, Ill., and Chester, Ill., penitentiaries to increase the production of stone at the two prison quarries.

The protest initiated at Belleville, Ill., at a meeting of operators in that area, who contended that they had increased the capacities of their plants by 50 per cent to take care of an anticipated increase in the use of their material for road construction purposes.

The stone which would be produced by prison labor, under the governor's plan, would be used for secondary road construction by the state, and as limestone for agricultural purposes. The capacity of the penitentiaries would be 200 cars a week at both prisons, which would produce a total of 1,100,000 tons of stone and limestone a year.

The stone producers point out in the draft of the resolution that this production would be sufficient for the improvement of 500 miles of roads annually, which would be more than 50 per cent of the tonnage required for secondary road construction.

Pennsylvania-Dixie May Lease New Iowa Quarry

The Pennsylvania Dixie Cement Corp. is reported to be considering leasing and operating a new limestone quarry at Winterset, Ia. The company operates a cement plant at Des Moines.

Bluffton Stone Company Builds Crushing Plant

The Bluffton Stone Co., Bluffton, O., which was recently organized, has started work on the construction of its new crushing and screening plant. Completion by early summer is expected, when quarrying and plant operations will be begun.

March Building Best Since August, 1929

CONTRACTS TOTAL $459,119,000

March contracts for building and engineering projects in the 37 states east of the Rocky Mountains reached a total of $459,119,000, according to F. W. Dodge Corporation. This was the largest monthly total since August of last year; it registered the full seasonal increase of 45 per cent over February of this year, and it was only 5 per cent under March, 1929. Contracts in December, 1929, were 27 per cent under December, 1928; each succeeding month of this year has lessened the spread between current contract volume and that of a year ago. This year's first quarter contract total has amounted to $1,100,147,200, being approximately 12 per cent behind the corresponding period of 1929.

As in the case of the two preceding months, March awards for the construction of public works and utilities, totaling $105,349,800, led all other types at 23 per cent of the total. Contracts let for residential buildings amounted to $101,491,600 or 22 per cent of the aggregate; awards for commercial structures totaled $80,001,500 or 17 per cent; and lettings for industrial construction amounted to $74,332,600 or 16 per cent.

Contemplated new work of all kinds reported in March amounted to $732,735,900, compared with $780,209,400 reported in February, and $886,075,100 in March of last year.

The Metropolitan New York territory in the accompanying table includes northern New Jersey, Long Island, Westchester, Orange, Putnam and Rockland Counties. The upstate New York territory covers all counties north of Orange, Putnam and Rockland Counties. The Pittsburgh territory comprises western Pennsylvania, West Virginia, Ohio and Kentucky. By Southern Michigan is meant the so-called southern peninsula. Chicago territory embraces northern Illinois, Indiana, Iowa, eastern and southern Wisconsin. The Central Northwest territory covers Minnesota, North Dakota, South Dakota, northern peninsula of Michigan and northwestern Wisconsin. St. Louis territory comprises southern Illinois, eastern Missouri, northeastern Arkansas, western Tennessee and northwestern Mississippi. Kansas City territory includes western Missouri, Kansas, Oklahoma and Nebraska. New Orleans territory embraces Louisiana, western and southern Arkansas, eastern and southern Mississippi. The Southeastern territory includes North Carolina, South Carolina, Georgia, Florida, Alabama and eastern Tennessee.

Donora, Pa., Slag Plant Is Under Construction

J. E. Cashion of Butler, Pa., is building a slag crushing and screening plant at Donora, Pa., using blast-furnace slag produced by the American Steel & Wire Co. The capacity of the plant will be 175,000 tons annually, according to Mr. Cashion, and the plant and equipment represents an investment of about $125,000. All equipment is to be electrically-operated from power purchased from the West Penn Power Co. Shipments will be made by rail and water.

Wallace Stone Co. Buys Steel Barge and Tug

The Wallace Stone Co. of Bay Port, Mich., has purchased the steel barge *Pennsylvania* from Buffalo interests. The barge is 186 ft. long, 40 ft. wide and has a capacity of from 1,500 to 2,000 tons.

The Bay Port concern also has purchased the steam tug *Americus*. The tug is 102 ft. long, 30 ft. wide and its engines develop 350 horsepower. The two boats will be delivered as soon as navigation opens. Each carries a crew of nine men.

Lake Sand Producers Acquire S.S. Brazil

NEW EQUIPMENT IS INSTALLED

The steamer *Brazil*, one of the two dredges operating until recently on the Chicago lake front project, has been taken over by the Marine Dredge & Gravel Co., with offices at 75 East Wacker Drive, Chicago, Ill. This company recently organized for the production of gravel and torpedo sand, is headed by J. C. Hoskins, president, the other officers being Jean M. Allen, vice-president, Walter S. Aagard, secretary, and Charles H. Brent, treasurer.

Under the direction of Edmund Shaw, consulting engineer, a modern screening and classifying plant is being installed on the *Brazil* with a capacity of 2,000 cu. yd. in six hours. Several bars or beds rich in gravel and torpedo sand have been located in Lake Michigan adjacent to Chicago. The material will be dredged and classified on the *Brazil*, the fine sand being returned to the lake, while the gravel and torpedo are pumped into bunkers on the dredge. When a full cargo is loaded, the boat will go, under its own power, to the company's docks where the material will be pumped to stockpiles by the same equipment which excavates it from the lake bed.

Production will be started about May 1, under the direction of John Harrington, operating manager. Present plans are to wholesale the products to the Chicago dealers.

Illinois Geologists Will Fete Quarter-Centennial

The Illinois State Geological Survey is to celebrate the quarter-centennial of its founding with a two-days' meeting at Urbana, Ill., April 30 and May 1, 1930. In conjunction with this celebration the Illinois State Academy of Science will hold its annual meeting on the succeeding two days.

BUILDING AND ENGINEERING CONTRACTS AWARDED DURING MARCH, 1930, BY TERRITORIES, EAST OF ROCKY MOUNTAINS

Territories	March, 1930, Building and Engineering Contracts Awarded	Per Cent Increase or Decrease, Compared with—		Contracts Awarded During Jan., Feb., and Mar., 1930, and Per Cent, Increase or Decrease Compared with Same Period 1929		Distribution of March, 1930, Contract Awards					
		Feb., 1930	Mar. 1929			Residential	Commercial and Industrial	Public Works and Utilities	Educational	Public Institutions and Hospitals	Contemplated Building Reported
New England states	$29,585,200	+ 52.0	− 7.4	$66,880,300	− 24.0	$10,231,700	$6,054,000	$4,856,800	$4,258,500	.....	$41,828,900
Metropolitan New York and vicinity	89,749,700	+ 18.0	− 12.5	102,182,200	− 12.0	19,374,800	30,794,500	.....	9,088,900	$11,308,000	228,434,600
Up-state New York	14,260,300	+ 12.0	+ 52.0	36,037,600	+ 13.0	2,148,600	.....	3,146,300	2,299,800	2,523,100	31,124,700
Middle Atlantic states	47,502,500	+ 42.0	− 18.0	148,103,400	− 6.5	15,631,400	11,400,200	8,295,800	3,385,200	.....	64,702,500
Pittsburgh territory	73,519,600	+ 67.0	+ 39.0	155,332,600	− 3.0	9,806,700	23,997,000	19,592,900	.....	5,391,200	79,028,500
Southern Michigan	12,470,400	+ 38.0	− 64.0	31,401,500	− 49.6	4,996,500	3,466,700	2,043,300	.....	.....	21,835,700
Chicago territory	67,557,500	+101.0	− 22.8	130,696,100	− 38.5	12,388,700	32,807,700	14,770,400	.....	.....	79,151,500
Central Northwest	9,392,300	+218.0	+156.5	16,193,600	− 3.7	1,441,500	3,856,200	2,601,600	825,600	.....	9,207,800
St. Louis territory	14,493,800	− 11.0	− 29.0	39,044,300	− 21.4	5,003,400	2,458,200	4,042,200	988,100	.....	25,301,500
Kansas City territory	41,179,900	+ 87.0	+ 66.4	79,142,400	+ 35.8	7,983,500	5,468,700	23,102,200	.....	1,710,000	39,561,000
Texas	21,694,800	+ 13.0	+ 4.0	59,068,400	+ 1.1	3,038,500	4,143,200	6,537,600	3,080,800	.....	42,292,600
New Orleans territory	10,424,300	+ 26.0	− 28.7	33,742,400	+ 14.3	1,131,800	687,400	6,511,800	1,536,300	.....	16,238,800
Southeastern territory	27,288,700	+ 32.0	+ 3.0	69,462,000	− 4.0	8,314,500	5,703,900	3,983,700	2,725,900	.....	54,027,800

New Cement Plant's Plans Are Outlined

COSTS AND RECEIPTS ANALYZED

With plans under way for a cement plant at National City, Cal., and work already started on the quarry located in the Imperial Valley nearby, J. Fred Larson, assistant to the president of the Columbia Cement Co., recently addressed the citizens of National City on the proposed plant, pointing out the possible production of the plant and reciting cost and profit figures. Mr. Larson said, in part:

"Most of us are familiar with the market south of us along Mexico, Central and South America, which last year used two and a quarter million barrels of cement, mostly from Europe, selling from $19 to $20 per ton. There is a nice profit in this business for us at $10 a ton, and on the basis of our freighting contract we can deliver cement in the southern markets for $5 per ton below our European competitors and when we figure this margin for only one-half million barrels for the first year, we are not taking any chances.

"It will require 150 vessels, carrying from 200 to 1,000 tons each and over 6,000 freight cars annually, to move this business.

"For the handling of this export business there are small, fast motor vessels that can carry two or three thousand tons at close intervals and discharge right at the dock at any of the shallow ports. A good part of the business, however, will move in larger vessels in regular trade all loaded directly at our docks.

"Presuming a production of standard cement, 1,000,000 bbl.; 200,000 bbl. white cement, 20,000 tons glass sand, 30,000 tons burned and hydrated lime, 30,000 tons pure lime rock, total $3,635,000, it is interesting to know just what becomes of these dollars right here at home.

"For labor goes $363,500. The power suppliers get $181,750, fuel oil companies $400,000, and local railroads receive another $400,000. Quarry expense is around $363,000, and $254,000 is set aside for general repairs to the mill, etc. This runs around $1,963,000. Deduct this, if you please, from an income of $3,635,000 and we have left about $1,672,000. We have about 15c per barrel overhead and another few cents per barrel for taxes, etc.

"Another $150,000 to cover interest obligations on the preferred stock, still leaving us over a million and a half dollars in profits for distribution, part of which will be set aside for improvements to the plant and increased capacity.

"The vessels for our export trade will pay another $90,000 to the longshoremen and $43,000 for wharfage and handling on the dock. Add to this $133,000 our production receipts and you have a grand total of $3,768,000 distributed annually in your local trade channels, a third of which, going to our stockholders, may be salted away.

"The following outline shows the exact per cent of funds to go under the various divisions:

ESTIMATE OF TOTAL RECEIPTS		
1,000,000 bbl. standard cement at $2		$2,000,000
200,000 bbl. white cement at $6		1,200,000
20,000 tons glass sand at $4.50		90,000
30,000 tons burned and hydrated lime at $10		300,000
30,000 tons crushed lime rock at $1.50		45,000
		$3,635,000
DISTRIBUTION IN LOCAL TRADE CHANNELS		
Labor at 10%	$363,500	
Power at 5%	181,750	
Fuel (oil) 11%	399,850	
Freights 11%	399,850	
Repairs at 7%	254,450	
Quarry expense 10%	363,500	1,962,900
Balance		$1,672,100
500,000 barrels — 100,000 tons Longshoring 90c	$ 90,000	
Wharfage and handling at 43c	43,000	133,000
Total for distribution		$3,768,000

[In commenting on the foregoing statement of expected receipts the editor of another trade journal questioned their accuracy, saying that "the editor, for one, would like it explained how it is possible to 'distribute' more money for labor than the proposed operation is to take in for its product!" In reply to a request for a statement that would explain this criticism Mr. Larson writes: "You undoubtedly have analyzed the article in *Rock Products* of March 15th and, like many of our friends, have found no discrepancy in the figures as the editor of *Rock Products* would indicate."—EDITOR.]

Mississippi Will Spend 80 Millions for Roads

Attorney-General George Mitchell of Mississippi, handed down a ruling, April 14, 1930, stating that a bill passed by the state legislature making an appropriation of $80,000,000 for highway construction, had become a law by default. Governor Bilbo had failed to sign the bill. The chief aim of the law is to relieve to a considerable extent Mississippi's unemployment condition.

International Salt May Acquire Sterling Plant

Preliminary negotiations are reported under way for the acquisition of the Sterling Salt Co. by the International Salt Co., of Scranton, Pa. The International company has plants at Retsof, Ludlowville and Reading, N. Y., Avery Island, La., and Detroit, Mich.

Container-Car Tests Attracting Attention

EXPERIMENT WITH BULK CEMENT

Experiments in the transportation of cement with container cars, now being conducted by the New York Central R. R. at Alsen, N. Y., where a plant of the Alpha Portland Cement Co., is located, are attracting the attention of the cement industry in the East, and producers and shippers of other non-metallic minerals are likewise watching developments for possible profits in their operations.

The growth of the container-car method of handling common brick from the point of manufacture to the point of ultimate consumption has led the railroad to undertake certain experiments, with the idea of handling lime, cement, gypsum and similar materials from plant to building operation or nearest terminal. In the course of the experiments it became necessary to develop three different types of containers, one for brick or other bulk material, another watertight top and bottom container for cement, lime and other calcined materials, and a third for packaged freight.

A container holding from forty to fifty barrels of cement in bulk weighs from 15,200 to 19,000 lb. and to handle it quickly and safely 15-ton crawler-mounted derricks are employed to lift the containers from cars to truck at New York terminal points.

The next step of development, according to railroad authorities, will be the actual delivery of the original mill-loaded container either at the street-curb at job site or, perhaps, at any floor of the building where the material is to be used in construction.

Atlantic Lime Rock Co. Improves Crusher Plant

The Atlantic Lime Rock Co. is installing machinery at its plant near Washington, Ga., where lime rock is to be crushed and sized for road work. The machinery is to be electrically-operated from power supplied by the Georgia Power Co. The power line to the plant has already been completed.

Operations Resumed at Tennessee Cement Plant

The Cumberland Portland Cement Co. plant at Cowan, Tenn., which has not been in operation since the first of the year, has resumed operations, according to Frank Pearson, general manager.

Prospects are extremely bright for a continuous run for the major portion at least of the remainder of the year, according to Mr. Pearson.

Minimum Rehandling and Variety of Sizes Features of New Stone Plant

Operations of Elmhurst-Chicago Stone Company Well Balanced in Every Respect

THERE has been a distinct trend in the crushed stone industry, especially during the last few years, toward the construction of permanent, fireproof plants using the latest and best types of equipment. These plants cost considerably more to build than the old-style makeshift plants but this factor is more than overbalanced by the longer life, greater production, and more economical operation of the more expensive plants. This trend is largely due to competition which has become keener every year until today only the most efficient plants with good deposits of stone, economical transportation and access to a steady market can show a steady profit.

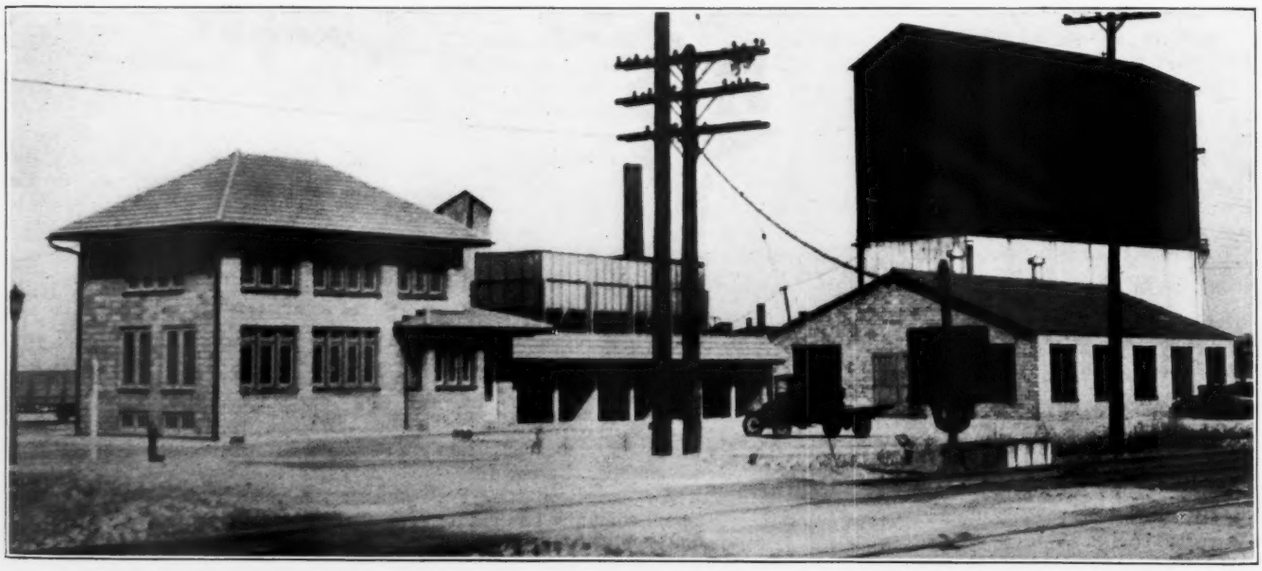
Plants of this type are built only on good deposits of stone of sufficient size to guarantee operation for a period long enough to insure an adequate return on the investment. They are of concrete and steel construction throughout and are so designed that any future enlargements or changes can be made at a minimum of expense and often without interference to operations.

The Elmhurst-Chicago Stone Co. of Elmhurst, Ill., one of the pioneer operators in the Middle West, is erecting a new limestone crushing and screening plant which is a splendid example of this type of plant and, when completed, will rank with the best in the country. There are many plants that have greater capacity but none of these have more modern and efficient equipment or can turn out as good a product more economically. Perhaps the outstanding feature of the plant is the flexibility of the conveying and screening system which allows the production of a wide range of sizes with a minimum of rehandling. No expense was spared in the construction of the plant, but this will be more than overbalanced by the economical operation made possible by these expenditures.

Every possible future emergency has been foreseen and provided for in the design of the plant. It has not been overbuilt, every unit being well balanced with respect to the market in sight. The buildings, conveyor galleries, etc., have all been built to accommodate larger units should this become necessary. Provision has also been made for washing should this become advisable. This plant has a capacity of about 300 tons per hour, an increase of 50 per cent over the old plant. About 10 per cent of the product of the plant is shipped by rail within a radius of 75 miles for ballast. The bulk of stone is delivered by truck within a radius of 20 miles. Most of this is used in concrete highway and building construction.

The plant is located at the intersection of First and West streets about one mile west of the center of Elmhurst, which is a rapidly growing suburb about 18 miles west of Chicago. The plant is on the main line of the Chicago & North Western Railway, with which it is connected by a switch. A ½-mile siding is now being built to the Illinois Central Railway main line, which is west of the plant. It is also on one of the new super-highways radiating from the Chicago loop.

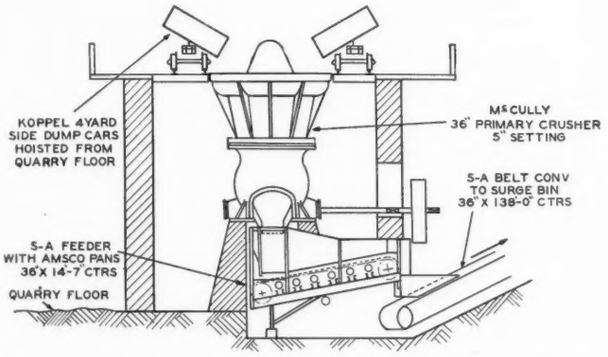
The history of quarrying operations at this loca-



The office, garage and machine shop, with steel truck-loading bins and screening building in background.

tion goes back about 60 years, although they were on a very small scale at that time. In 1883, Adolph Hammerschmidt got control of this property and erected a crushing and screening plant. This was rebuilt and enlarged from time to time to keep up with the growing demand for crushed stone. In 1913 the two-unit plant which is now being replaced was built. This was one of the first plants to use traction-wheel shovels and a large primary crusher.

Both of these plants were producing to capacity and because of their age had reached the point where either a new plant or extensive additions to the old plants became necessary. Early in 1929 the company started a careful survey of their field. This included the present and future market, the present costs, and the possibility for lowering production costs. After investigating the tendencies in the business it was decided to build an entirely new plant with a greater capacity, provision for expansion, and sufficient flexibility to produce rock of any size, mixture or specification.

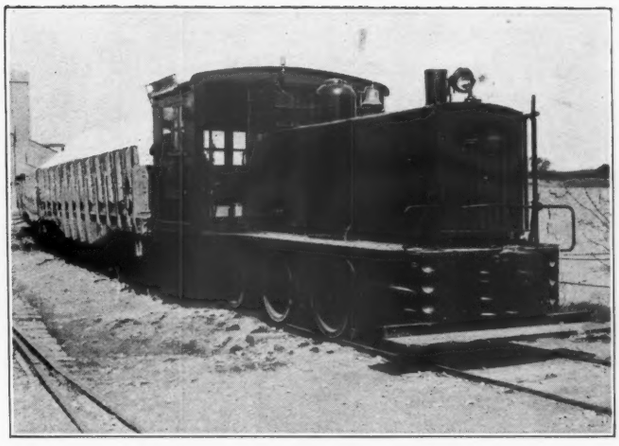

KOPPEL 4YARD SIDE DUMP CARS HOISTED FROM QUARRY FLOOR
McCULLY 36" PRIMARY CRUSHER 5" SETTING
5-A BELT CONV TO SURGE BIN 36"X 138-0" CTRS
5-A FEEDER WITH AMSCO PANS 36"X 14-7" CTRS
QUARRY FLOOR

Sectional view through primary-crusher building showing pan-feeder discharge to belt conveyor.

Preliminary work was started in March, 1929, and the Stephens-Adamson Mfg. Co. was given the contract for designing the plant and furnishing all the conveying and screening equipment. The contract for fabricating and erecting the structural steel work and spouts was given to the Mississippi Valley Structural Steel Co. At the present time the machinery has all been installed and, allowing the usual time for adjustment, the plant should be in full operation by the first of May.

The quarry is now about 20 acres in extent with a face averaging about 70 ft. in height. The overburden, which runs from 4 ft. to 20 ft. in depth, is removed by a ¾-cu. yd. Osgood steam shovel and hauled away in Kilbourne and Jacobs side-dump cars by a gasoline locomotive. Some of the hauling is also done in trucks. The stone is a dolomitic limestone of good quality free from clay seams or other impurities. It has a known depth of about 250 ft.

Single-row bank shots of two or three holes each are made, the proximity to a residence section making larger blasts impossible. Drilling is done by a 6-in. Loomis Clipper electrically-driven well drill. Pennsylvania Trojan 40 per cent dynamite and Cordeau-Bickford safety fuse are used for these blasts.



One of the gasoline locomotives switching cars.

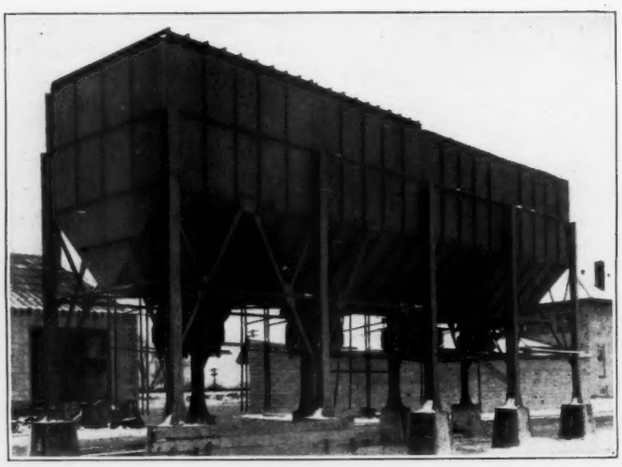
Secondary drilling is done with Ingersoll-Rand Jackhamers. Hercules 40 per cent dynamite and Cordeau are used for these shots. M. M. Bales, plant superintendent, personally supervises all blasts.

A No. 73 Osgood and a No. 70-C Bucyrus steam shovel, each equipped with traction wheels and 2½-cu. yd. dippers, load the stone into Koppel 6-cu. yd. steel side-dump cars. These were specially built to the company's specifications. The cars are hauled in trains to the crushing plant by three Whitcomb gasoline locomotives of 8, 12 and 15 tons. All tracks in the quarry and at the plant are standard gauge.

The cars are hauled up a double incline to the Superior McCully No. 18 primary gyratory crusher into which they discharge from either side. This crusher reduces to 8-in. maximum size. A stone hook over the crusher dislodges large rock and a chain hoist handles all repair parts. The cars are dumped by two Whiting Co. air hoists. A 150-hp. General Electric motor operates a line shaft through a ten-rope drive. The two single-drum double-friction hoists operating the cars are driven from this shaft, which also drives the primary crusher through another ten-rope drive. This

Locomotive crane loading from stockpile to truck.

Discharge side of primary gyratory crusher.

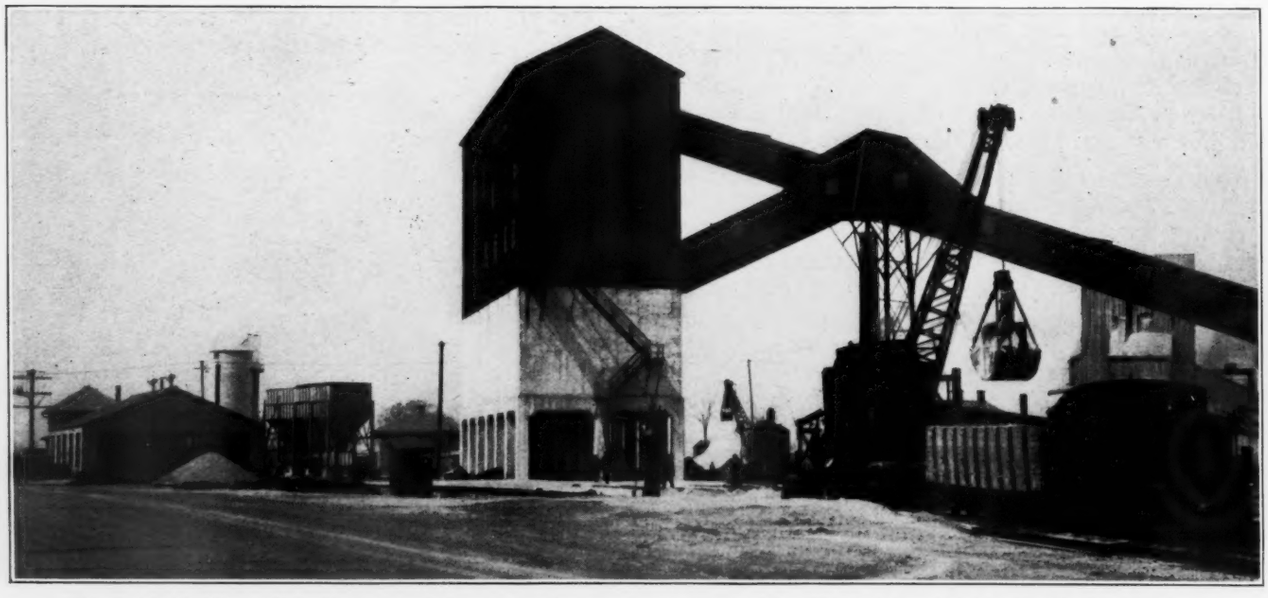


The truck-loading bins with the machine shop, garage and office in background.

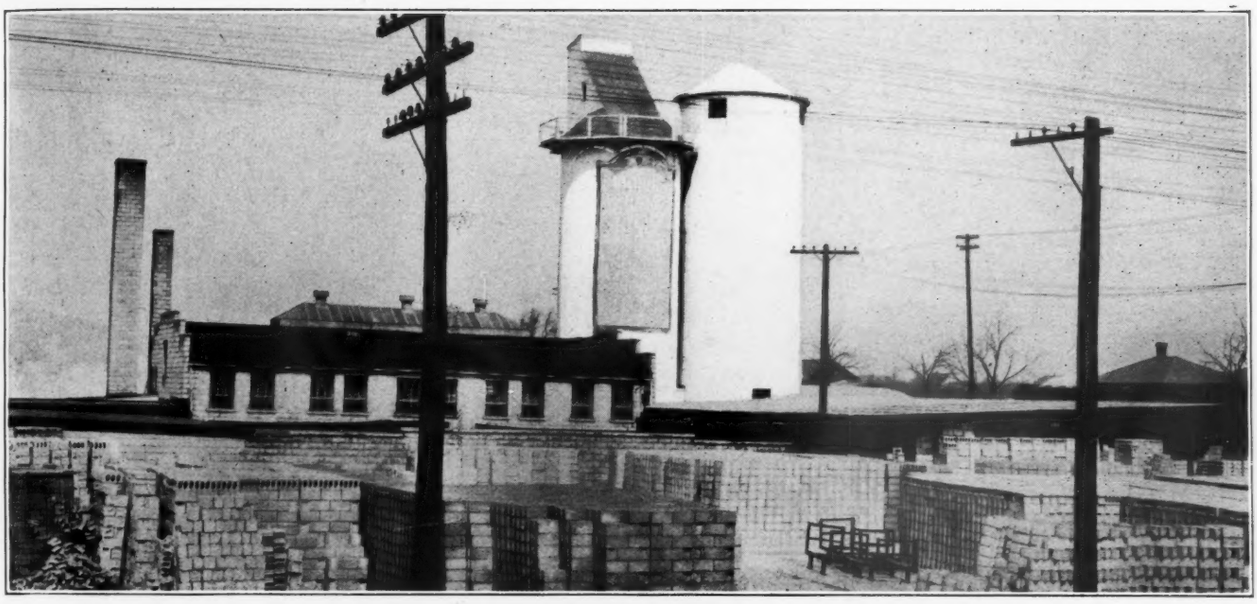
building with its hoists and crusher is a part of the old plant but is not being replaced at present. The stone was formerly delivered by two separate inclined belt conveyors to the two unit plants previously described, where it was scalped, crushed and screened for delivery. All buildings and equipment from this point on are part of the new plant.

The primary crusher discharges to a 36-in. Stephens-Adamson pan feeder with Amsco manganese steel pans driven at the tail end by a 7½-hp. Westinghouse motor through a Falk reducer. This discharges onto a 36-in. belt conveyor, on 138-ft. centers and with an inclination of 19 deg., to the top of the new secondary crusher building. This belt has a capacity of 600 tons per hour. It travels on Stephens-Adamson Simplex carriers equipped with Timken roller bearings and is driven by a 40-hp. Westinghouse induction motor through a Falk reducer. The head shaft for this conveyor and all of the other inclined belt conveyors is equipped with a Stephens-Adamson silent safety pawl to keep the loaded belts from reversing in case of power interruption. Hewitt Gutta Percha conveyor belting is used.

The conveyor discharges into a 500-ton capacity structural steel surge bin on top of the secondary crusher building. This bin should decrease operating costs by helping to maintain a uniform flow



Screening building showing arrangement of return conveyor. Machine shop and products plant in background.



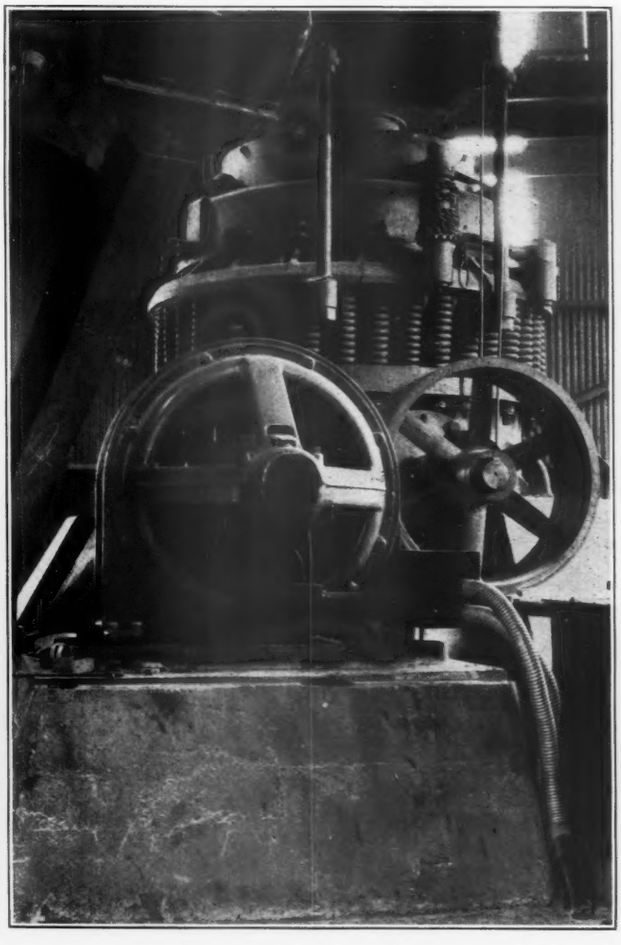
The concrete block plant with outdoor storage yard.

of stone through the scalping screen, secondary crusher and the screening plant. In an emergency it can be filled in a little over an hour and will then keep the plant operating steadily for about two hours. The bin is of steel plate construction and is supported on extra heavy structural columns.

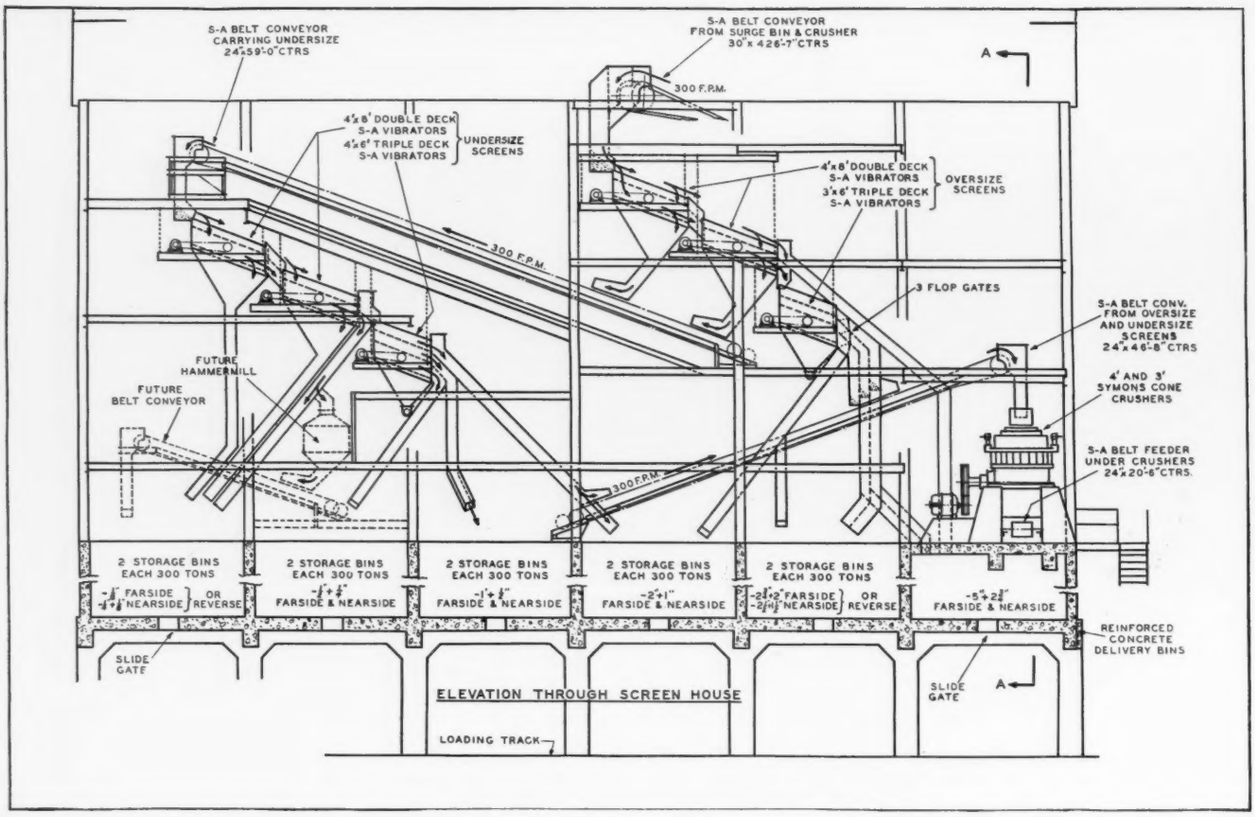
The bin discharges onto another 36-in. Stephens-Adamson pan feeder similar to the one at the primary crusher. The patented Amsco manganese steel pans travel on a series of closely spaced rollers which, together with the patented design of the overlapping pans, prevents any sag between the supporting rollers. This feeder is driven by a 5-hp. constant-speed Westinghouse motor through a Falk reducer and a Stephens-Adamson J. F. S. Type RG variable speed reducer which can be adjusted for any speed between 24 and 144 r.p.m. This enables the operator to deliver any tonnage between 50 and 350 tons per hour. This control feature will be of great value in regulating the maximum volume when different sizes of stone are produced.

The discharge from the variable-speed feeder will normally be scalped over a Stephens-Adamson 5-ft. by 8-ft. single-deck vibrator screen. The oversize is crushed by a 5½-ft. Symons cone secondary crusher set for a 2½-in. maximum. As an emergency feature, a bar grizzly has been mounted

Electrical equipment being installed in secondary-crusher building.



The 5½-ft. cone secondary crusher with by-pass chute from grizzly to main conveyor at left.

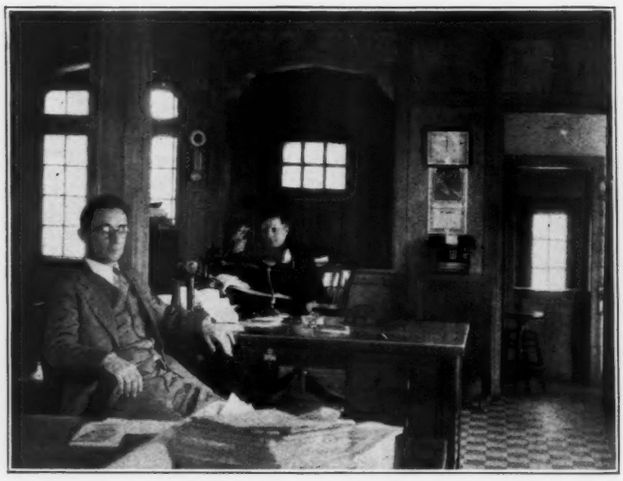

S-A BELT CONVEYOR CARRYING UNDERSIZE 24"x59'-0" CTRS
S-A BELT CONVEYOR FROM SURGE BIN & CRUSHER 30"x426'-7" CTRS
300 F.P.M.
4'x8' DOUBLE DECK S-A VIBRATORS
4'x6' TRIPLE DECK S-A VIBRATORS
UNDERSIZE SCREENS
4'x8' DOUBLE DECK S-A VIBRATORS
3'x6' TRIPLE DECK S-A VIBRATORS
OVERSIZE SCREENS
3 FLOP GATES
S-A BELT CONV. FROM OVERSIZE AND UNDERSIZE SCREENS 24"x46'-8" CTRS
4' AND 3' SYMONS CONE CRUSHERS
S-A BELT FEEDER UNDER CRUSHERS 24"x20'-6" CTRS.
FUTURE HAMMERMILL
FUTURE BELT CONVEYOR
2 STORAGE BINS EACH 300 TONS
FARSIDE & NEARSIDE
OR REVERSE
REINFORCED CONCRETE DELIVERY BINS
SLIDE GATE
ELEVATION THROUGH SCREEN HOUSE
LOADING TRACK

Sectional view of screening building.

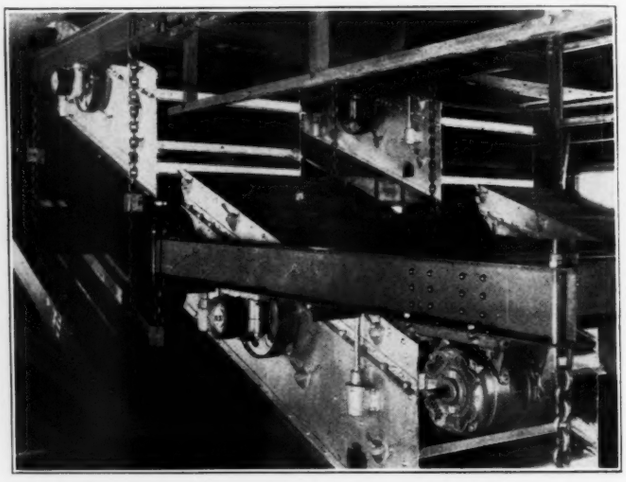
alongside the screen on a shuttle frame. This is arranged so that it is a simple matter to roll the grizzly into place over the crusher whenever screen panels are being changed or adjustments made. The screen is driven through a 5-strand Dayton cog-belt drive by a 7½-hp. Westinghouse motor and the crusher through a 9-strand Texrope drive by a 150-hp. General Electric motor.

A 30-in. Stephens-Adamson inclined belt conveyor on 426-ft. centers carries the crusher discharge and the fines from the scalping screen or bar grizzly to the new screen house on the bank above the quarry. Eight-ply Hewitt Gutta Percha conveyor belting is used. This belt has a capacity of 300 t.p.h. and is driven through two pulleys by a special tandem gear drive through a Falk speed reducer direct-connected to a 75-hp. Wagner motor. This is the only exposed gear drive in the entire plant and was necessary because the length of this conveyor required 360 deg. contact with drive pulleys to prevent slippage.

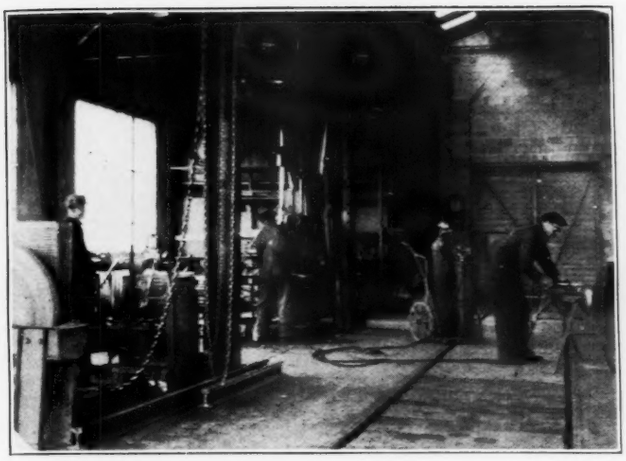
In the screen house, the stone first passes over a series of three Stephens-Adamson vibrator screens called the "oversize screens." The first two are 4-ft. by 8-ft. double deck, while the third is 3-ft. by 6-ft. triple deck. The oversize and second



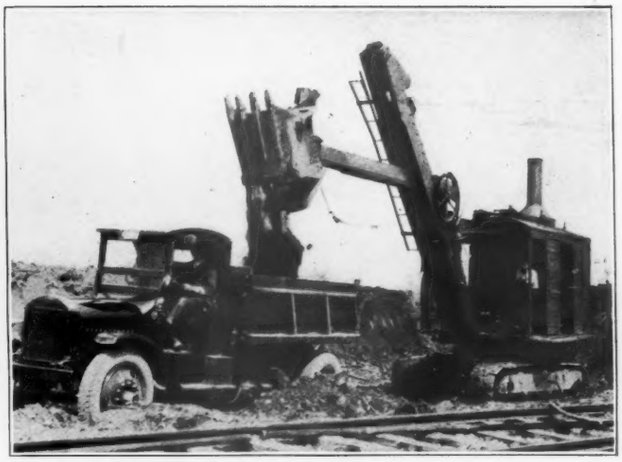
Interior of general plant office with weighing room in background.



Four of the six vibrating screens at one end of screenhouse. Note weighted-chain suspension.



Part of the machine and blacksmith shop.



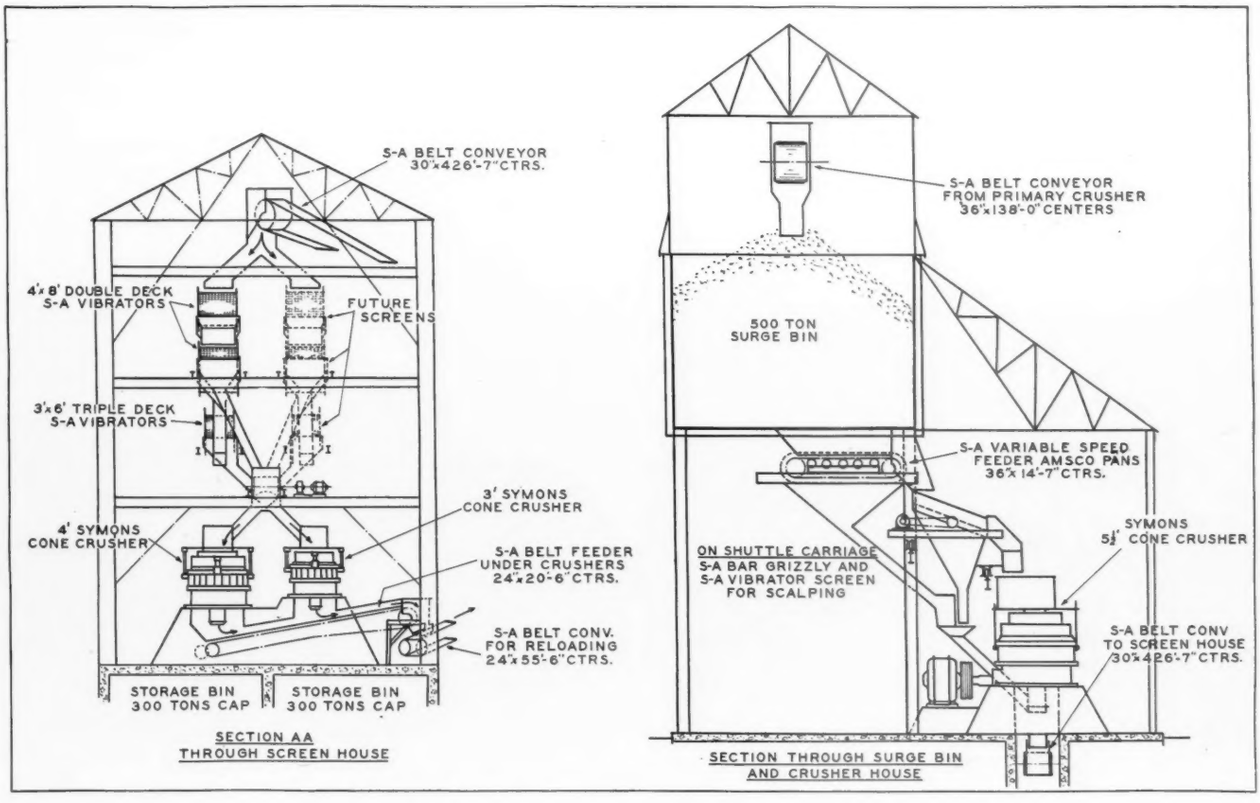
Shovel loading overburden to truck.

size from the first screen go to the second screen. The oversize from this goes through a chute to two bins for large stone, while the second size goes to the third screen. The three decks of the third screen deliver through chutes into any three of the six bins beneath or onto a conveyor to the recrushers.

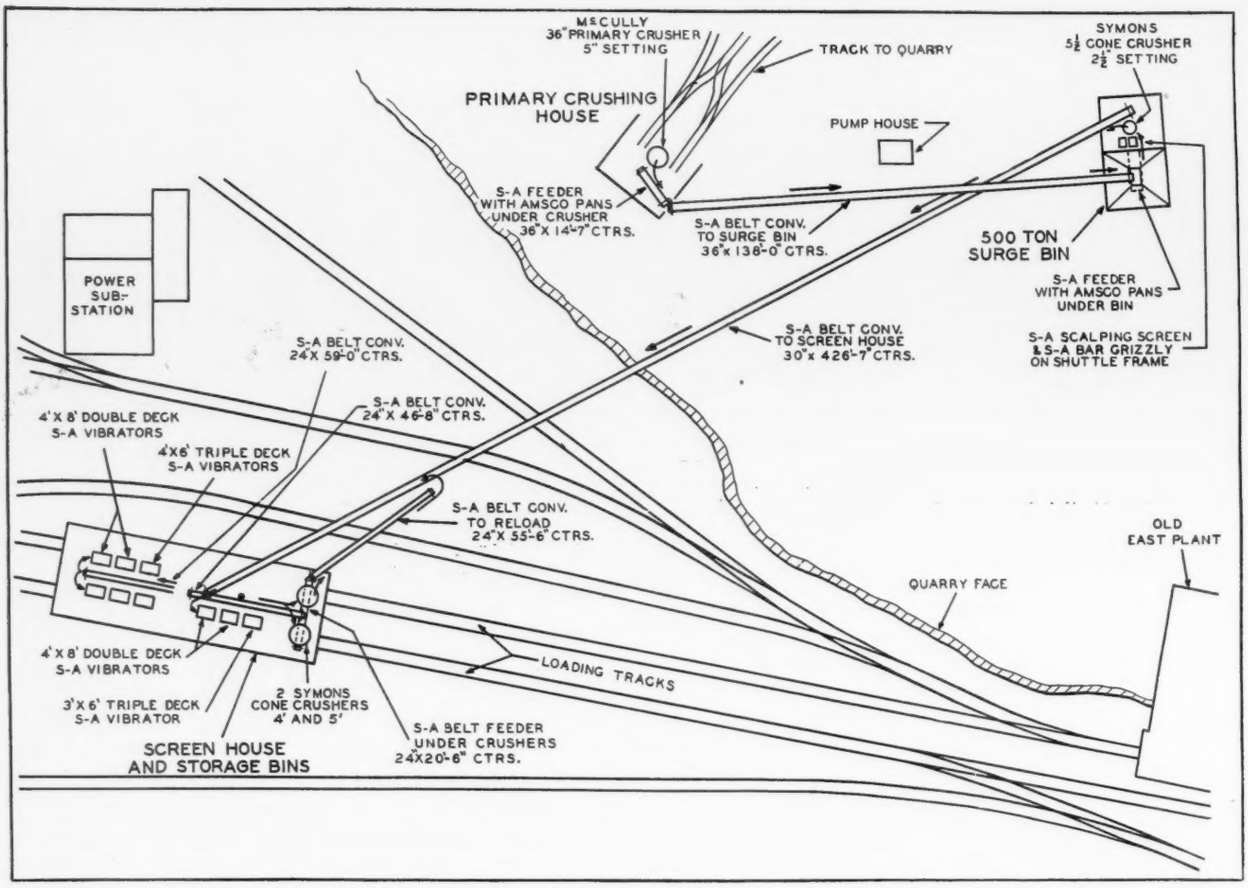
The fines from the first two screens are chuted to a 24-in. inclined belt conveyor on 59-ft. centers feeding the six "undersize" screens at the other end of the screen house. This conveyor is driven by a 10-hp. Westinghouse motor through a Falk reducer. It discharges through a split chute to two rows of three Stephens-Adamson vibrator screens. The first two pairs are 4-ft. by 8-ft. double deck, while the last pair are 4-ft. by 6-ft. triple deck.

The throughs from the first two pairs go to either of two fine stone bins, while the oversizes go to the two triple-deck vibrators. The two intermediate sizes from these go through chutes to any of four bins beneath. The fines also go to separate bins. The oversize from the triple-deck screens can be chuted either into bins or onto the same 24-in. by 43-ft. centers inclined belt conveyor which feeds from the triple-deck oversize screen to the recrushers. This conveyor is driven by a 5-hp. Westinghouse motor through a Falk reducer.

The two reduction crushers are 3-ft. and 4-ft. Symons cone crushers. The former is driven by


S-A BELT CONVEYOR 30"x426'-7" CTRS.
4'x8' DOUBLE DECK S-A VIBRATORS
FUTURE SCREENS
3'x6' TRIPLE DECK S-A VIBRATORS
3' SYMONS CONE CRUSHER
4' SYMONS CONE CRUSHER
S-A BELT FEEDER UNDER CRUSHERS 24"x20'-6" CTRS.
S-A BELT CONV. FOR RELOADING 24"x55'-6" CTRS.
STORAGE BIN 300 TONS CAP
STORAGE BIN 300 TONS CAP
SECTION AA THROUGH SCREEN HOUSE
S-A BELT CONVEYOR FROM PRIMARY CRUSHER 36"x138'-0" CENTERS
500 TON SURGE BIN
S-A VARIABLE SPEED FEEDER AMSCO PANS 36"x14'-7" CTRS.
ON SHUTTLE CARRIAGE S-A BAR GRIZZLY AND S-A VIBRATOR SCREEN FOR SCALPING
SYMONS 5½' CONE CRUSHER
S-A BELT CONV TO SCREEN HOUSE 30"x426'-7" CTRS.
SECTION THROUGH SURGE BIN AND CRUSHER HOUSE

Sectional view of screenhouse and secondary-crusher house.

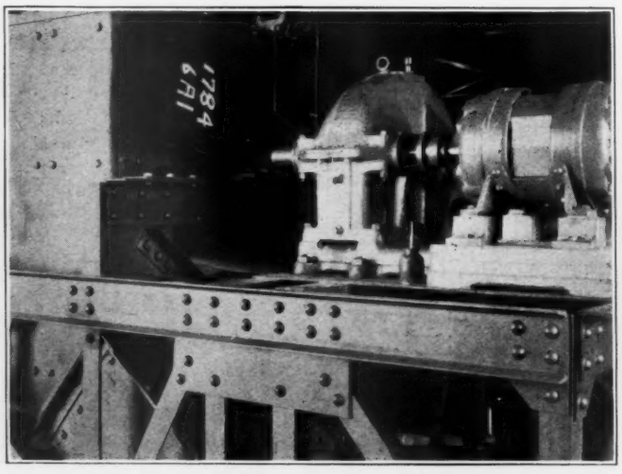

McCULLY
36" PRIMARY CRUSHER
5" SETTING
TRACK TO QUARRY
SYMONS
5½ CONE CRUSHER
2½ SETTING
PRIMARY CRUSHING HOUSE
PUMP HOUSE
S-A FEEDER WITH AMSCO PANS UNDER CRUSHER 36"X 14'-7" CTRS.
S-A BELT CONV. TO SURGE BIN 36"x 138'-0" CTRS.
500 TON SURGE BIN
S-A FEEDER WITH AMSCO PANS UNDER BIN
POWER SUB-STATION
S-A BELT CONV. TO SCREEN HOUSE 30"x 426'-7" CTRS.
S-A SCALPING SCREEN & S-A BAR GRIZZLY ON SHUTTLE FRAME
S-A BELT CONV. 24"X 59'-0" CTRS.
S-A BELT CONV. 24"X 46'-8" CTRS.
4'X 8' DOUBLE DECK S-A VIBRATORS
4'X6' TRIPLE DECK S-A VIBRATORS
S-A BELT CONV. TO RELOAD 24"X 55'-6" CTRS.
OLD EAST PLANT
QUARRY FACE
4'X 8' DOUBLE DECK S-A VIBRATORS
LOADING TRACKS
3'X 6' TRIPLE DECK S-A VIBRATOR
2 SYMONS CONE CRUSHERS 4' AND 5'
S-A BELT FEEDER UNDER CRUSHERS 24"X20'-6" CTRS.
SCREEN HOUSE AND STORAGE BINS

Layout of entire plant of Elmhurst-Chicago Stone Co.

a 50-hp. Allis-Chalmers motor through a 4-strand Texrope drive and the latter by a 60-hp. Howell motor through a 5-strand Texrope drive. Both of these crushers are mounted on concrete foundations over the concrete bins, which were built extra heavy at this point to support their weight.

These crushers discharge onto a 24-in. Stephens-Adamson belt feeder on 20-ft. 6-in. centers which feeds a 24-in. inclined belt conveyor on 55-ft. 6-in. centers. This discharges onto the 30-in. main conveyor from the secondary crusher. The feeder is driven by a 2-hp. Howell motor through a Falk reducer, and the return belt by a 10-hp. Westinghouse motor, also through a Falk reducer.

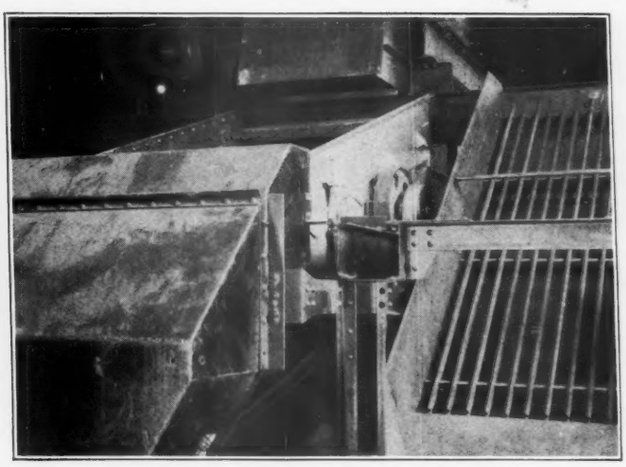
The reinforced concrete structure beneath the screen house consists of twelve separate storage and delivery bins, each of 300-tons capacity. They are in two rows and discharge through sliding gates in the bottom of each bin into either railroad cars or trucks. The gates are controlled from the ground by long levers. The spout system feeding to these bins is an interesting feature of the plant. Their



Speed-reducer drive of conveyor feeding six vibrating screens.

New plant from quarry Secondary-crusher building at left, screening building in background.

Arrangement of chutes from screens to bins with return conveyor to recrushers in center.



Vibrating and scalping screen feeding secondary crusher with pan feeder and drive in background.

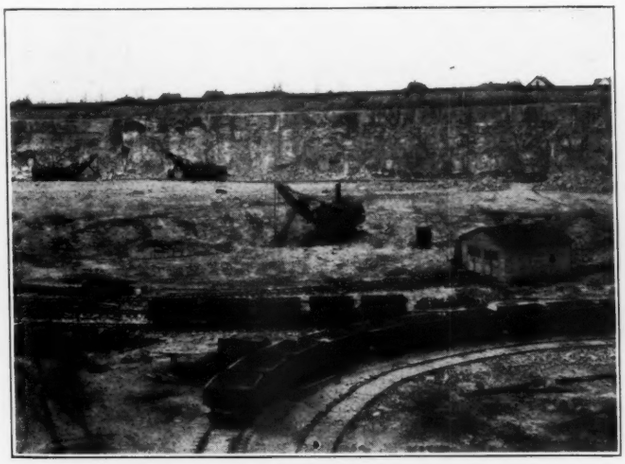
arrangement is so flexible that almost any size or mixture of sizes can be fed to any bin. The screens can also be adjusted so that a majority of any size desired can be produced when necessary.

The entire system, from primary crusher to the final sizing screens, is started from a control room located on one of the upper floors of the screening building. The primary and secondary crushers are manually controlled, but aside from these two large motors, the rest of the units are automatically started or stopped by one pushbutton. Each unit starts up automatically after the preceding unit is up to speed until the entire plant is running. A total of nearly 650 hp. used throughout the working day is controlled from this room. All starters, controllers, switches, cutouts and other electric equipment except motors are Cutler-Hammer.

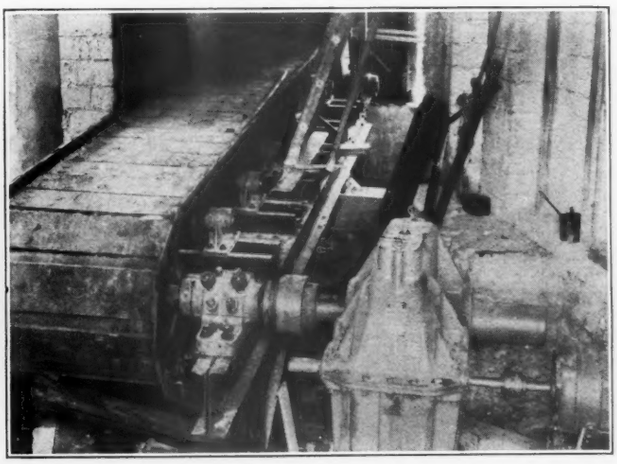
The secondary crusher building, the screening building, the two main conveyors and the short return conveyor are all of structural steel construction on concrete foundations and are covered with H. H. Robertson Co. protected corrugated metal. This metal is coated with asphalt and asphalt saturated asbestos felt and an outer coat, making it rust-, weather- and corrosion-proof. The conveyor galleries are floored with precast, reinforced concrete floor slabs which extend across the entire width of the gallery and are designed to fit closely at joints. The slabs have channel section reinforcing and were made entirely at the company's block plant.

The ten Stephens-Adamson vibrator screens which do all of the scalping and sizing of the stone are a recent development and have two features especially worthy of mention. The quick release screen clamps permit an unusually fast change of screen panels when these must be replaced or when a new sized product is desired. Each screen is mounted on a sub-frame which is suspended by weighted chains from the building supports, preventing any lateral vibration being transmitted to the building. Each screen can also be balanced for its normal load so that even the vertical vibration is reduced to a minimum. Each screen is driven by a 7½-hp. Westinghouse motor through a multiple-strand Dayton cog-belt drive. S. K. F. bearings are used in these screens.

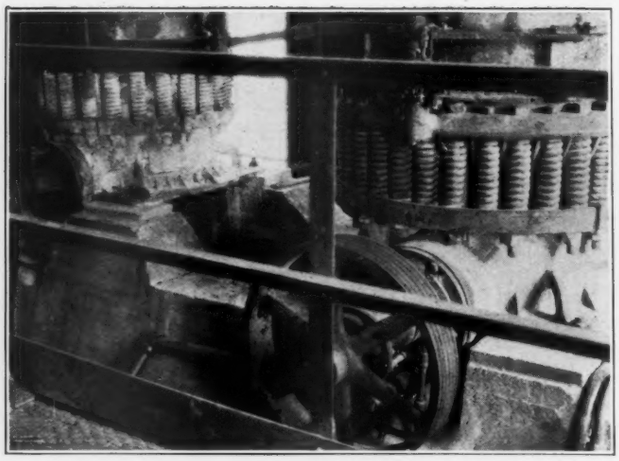
The conveyors throughout are equipped with Hewitt Gutta Percha conveyor belting carried on Stephens-Adamson Simplex carriers with Timken tapered roller bearings. All conveyors and feed-



View of quarry from primary-crusher building.



Pan feeder from the primary-crusher belt conveyor.

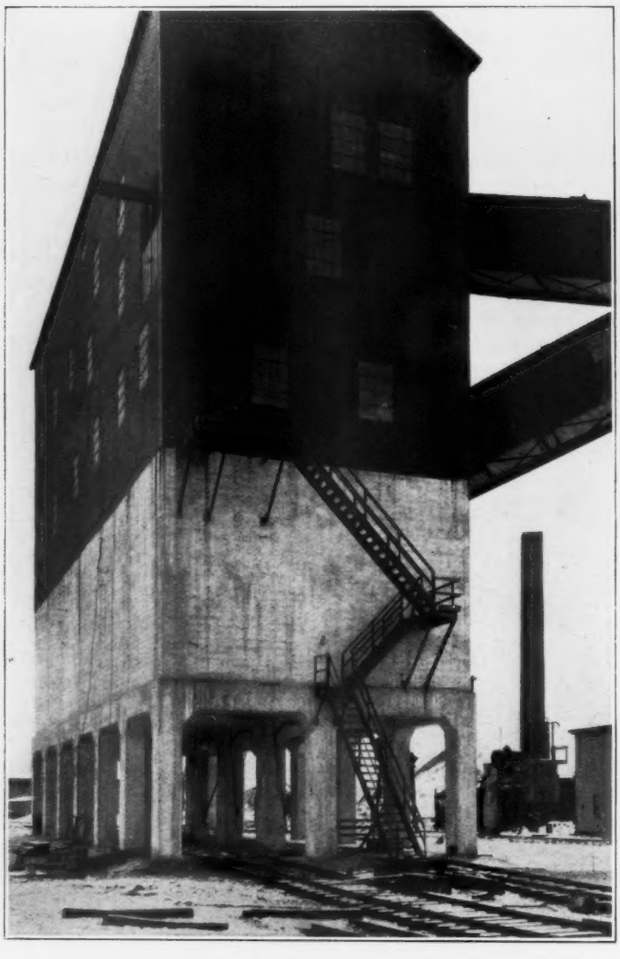


The 3 ft. and 4 ft. reduction crushers.

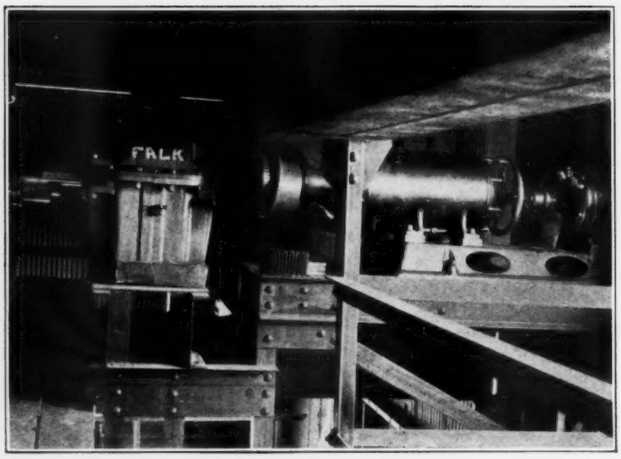
ers are driven through Falk speed reducers direct-connected by Falk-Bibby flexible couplings. All conveyor head and drive pulleys are fabric lined to prevent slipping. All the cable used in the entire operation is Broderick and Bascom Yellow Strand secured with Crosby cable clamps. Yale chain hoists are used throughout the plant to handle repair parts. An Ingersoll-Rand air compressor with a capacity of 200 cu. ft. per min. furnishes air for the air hoists and drills. Water is furnished by a vertical centrifugal pump with a 7-in. suction and a 6-in. discharge from a sump in the quarry.

A 20-ton Orton and Steinbrenner steam locomotive crane equipped with a 1¾-cu. yd. Blaw-Knox Dreadnaught clamshell bucket is being used at present to clean up the grounds, load stockpiled material to trucks for delivery and to unload cars of coal. A 25-ton McMyler-Interstate steam locomotive crane handling a bucket of the same size and make is also being used for these purposes. These cranes also handle material to five Butler steel bins, each of which has two Butler volume batchers for loading into trucks. A 20-ton Whitcomb and a 30-ton Plymouth gasoline locomotive are used for switching about the plant and for hauling overburden. A Fairbanks track scale housed in a small concrete block building is used for weighing cars.

The company also has a very modern and complete machine, blacksmith and repair shop located between the office and the new screening building. This building, which was completed in the summer of 1927, has concrete foundations and floor, concrete block walls, structural steel roof trusses and tile roofing. The large steel sash windows and skylights provide ample illumination even on a dark



End of screenhouse showing loading levers below.



Motor, variable speed reducer and speed reducer driving pan conveyor feeding secondary crusher.

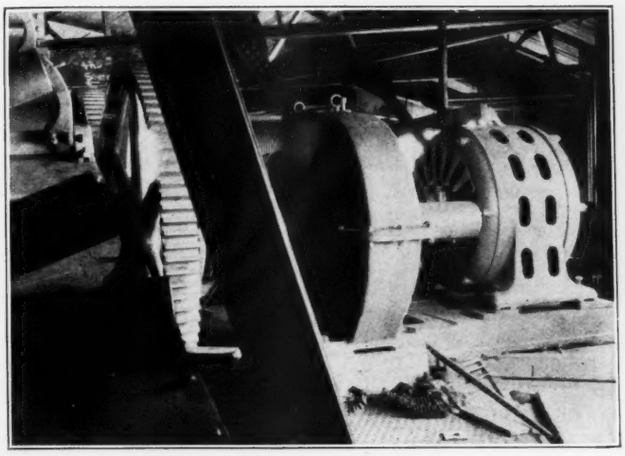
day, and ventilators in the roof provide ample air circulation.

The equipment in this building is unusually complete even for one of the most modern crushed stone plants in this country. Almost any kind of repair work that might be necessary can be done here. A 15-hp. electric motor drives a line shaft which operates an S. W. Putnam Sons 5-ft. swing bed lathe, a Reed-Prentice Co. 13-in. swing bed lathe, a Hendey Machine Co. milling machine, a Marvel hack saw, a small drill press, an emery wheel and a grindstone. There is also a Champion Blower and Forge Co. drill press, an Armstrong 6-in. well drill sharpener and another emery wheel, all driven from the same line shaft by a 6-hp. General Electric motor, a Chas. E. Elmes Engineering

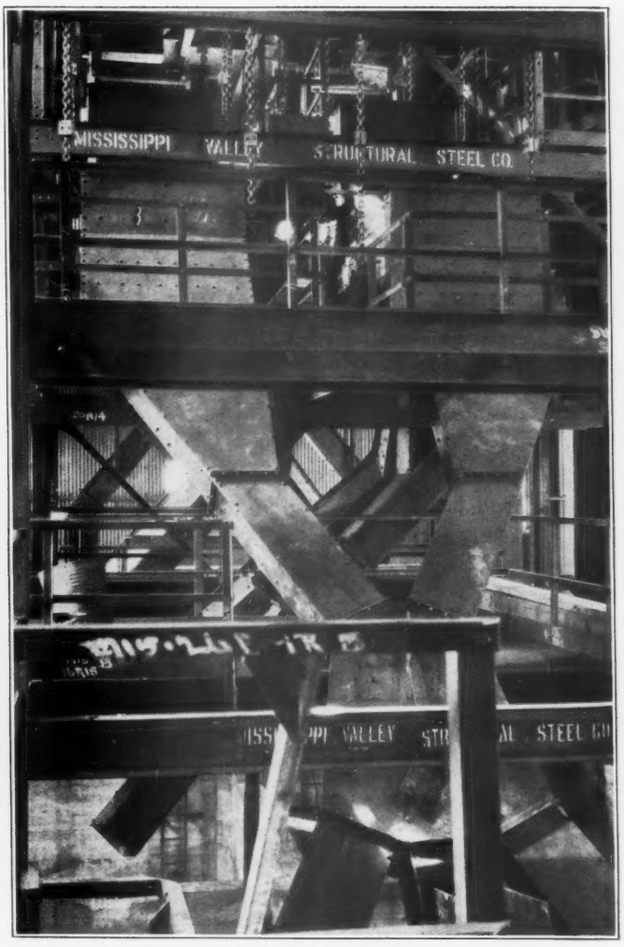
Works hydraulic press and a forge. Welding is done with Imperial welding equipment and an Imperial Brass Mfg. Co. Type A automatic acetylene generator and a Wilson Welding and Metals Co. 25-50 volt portable electric welder with a direct-connected 3-hp. Allis-Chalmers motor.

There are neat, well-stocked parts and storage rooms enclosed by wire partitions which can be locked. Overhead traveling chain hoists handle all heavy machinery and parts. A track running through the center of the building allows the locomotives, locomotive cranes and quarry cars to be run in for repair work.

The office building, which was completed in December, 1928, is also a very attractive and modern structure. It has concrete foundations and base-



Speed reducer and tandem drive of main conveyor.



Some of the vibrating sizing screens and chutes.

ment and is of concrete block construction with a green tile roof. The first floor houses the general plant office, a drivers' waiting room and a weighing room. This latter houses a Fairbanks 20-ton capacity platform scale equipped with a Weightograph to insure quick and accurate readings. The second floor houses the various private offices of the president, vice-president and treasurer. Both of these floors are attractively finished with silver-gray oak panelling and tan stucco plaster. Attractive lighting fixtures provide ample illumination. The basement contains a restroom, shower baths, gas heater, water heater and vault. There is a washroom on each of the three floors. Next to the office building is an 8-car concrete block garage with a green tile roof. All these buildings and the well-kept grounds give the plant a very neat and attractive appearance.

All the concrete block used in these buildings was made in the company's concrete products plant which is located on the property. This, incidentally, is one of the finest plants in the Middle West. It went into operation late in 1925 and was built to replace an older plant which was unable to keep up with the increasing demand for concrete block. The Universal stripper and face block machines were furnished by Thomas W. Noble & Co. Ideal and Blystone concrete mixers are used. This plant also serves as an outlet for the screenings from the stone plant. The volume of this business can be seen from the fact that 10,000 cu. yd. of screenings were used for making blocks in 1929.

Officers of the Elmhurst-Chicago Stone Co. are: Richard Hammerschmidt, president and general manager; George F. Hammerschmidt, vice-president and sales manager; Martin Hammerschmidt, treasurer; Lydia Hammerschmidt, secretary. M. M. Bales is superintendent.

Looking down main conveyor from the screening building.

What Does it Cost Your Plant to Make Motor-Truck Deliveries?

By WALDO HUTCHINSON

SIMPLICITY of operation, ease in compiling the necessary data and in eliminating all useless notations are particularly noticeable in the system used for recording motor-truck cost data as described in this article.

To lessen the clerical work required and to give the drivers a share in the responsibility, each man in charge of a truck makes out a daily record (Form I). This is filled out each morning with the record for the day before. The driver reads his total and trip mileage from his speedometer. A full day's service is 10 hours. Any time required for repairs is recorded as time out of service.

Instead of indicating miles per hour, which is not so necessary for a big truck, a clock arrangement is provided in connection with the "miles-traveled" register which totals the hours running. This is taken from the front truck wheel and registers only while the wheel is moving. Thus the mileage and running time records are made coordinately. Stops, waiting, loading, and unloading time are automatically deducted from the ten-hour day. When it is considered that while the truck is on the road all added expenses above overhead and regular maintenance build up, it is easily seen why these two elements—miles and hours traveled—enter so deeply into the daily cost figures. It is during this time that tires, gasoline, and oil are used, the elements of daily upkeep.

To get the daily gasoline consumption the garage men use a simple little scheme. The gasoline tanks on each car are filled every morning. In this way the number of gallons required to fill indicate the amount used the day before. This is noted on the daily report by the driver when the garage helper fills his tank.

This daily report (Form I) is the end of the driver's bookkeeping. A separate loose-leaf spring-back holder is used to keep a year's records for each truck. This is turned in to the garage superintendent each morning before the driver leaves for his day's trips. The garage superintendent makes a daily report (Form II) to the shipping clerk, summarizing the data on the driver's record of the day before. This, as far as his connection with the office except for requisitioning necessary purchases of supplies, material, repairs, and so on, is concerned, completes his part of the cost compilation.

Regular shop and garage requisitions enable the office to obtain a complete cost figure for any repairs or supplies—the same method as used by any other part of the factory. One especially valuable feature of the truck cost system is the ease with

DAILY RECORD MOTOR TRUCKS

NO._____ MONTH OF_____ 19__

	Miles		Hours							
	Total	Day	Service	Out Service	Run	Gas (*Gal.*)	Oil (*Gal.*)	Trans. Oil (*Gal.*)	Alcohol (*Gal.*)	Grease (*Lb.*)
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
Total										

Battery Recharges_____

FORM I: Simple to copy each morning, the miles per day, total miles and running hours indicated on his speedometer is all the "red tape" a truck driver has in gathering the truck-operation cost data.

DAILY TRUCK RECORD

DATE_____

Car No.	Driver	Hours Out of Service	Daily Mileage	Actual Hours Run	Gasoline (*Gal.*)	Oil (*Gal.*)	

FORM II: Every morning the garage superintendent turns in to the shipping clerk each driver's figures for the previous day's truck operation on the center form.

TRUCK RECORD

DRIVER_____ **MONTH OF**_____

CAR No._____

Date	Trips	Stops	Loads	Pickups	Tonnage		Hrs. of Service	Hrs. out Service	Daily Mileage	Actual Hours Run	Gasoline (*Gal.*)	Oil (*Gal.*)

FORM III: All operating information for the cost department is reported by the shipping clerk who makes a monthly performance record for each truck.

which it dovetails in with the regular routine followed in gathering other cost figures.

The shipping clerk is the logical man to report stops, loads, trips, and so on. This is done on Form III, a separate record sheet used for a monthly report on each truck. Trips, stops, loads, pick-ups, and tonnage are copied from the clerk's daily record, while the right-hand half of this report is a direct copy of the garage superintendent's daily report (Form II). Red crosses indicate the figures on truck No. 5 for the first day of the month as carried on all three forms.

GASOLINE_____ **RECORD FROM**_____ **TO**_____ **19**__

Day	Gal. in Tank A. M.	Gal. Received	Gal. in Tank P. M.	Truck No. 1	Truck No. 2	Truck No. 3	Truck No. 4	Truck No. 5	Truck No. 6	Mr. Clenny	Mr. Russell	Mr. Waster	Salesmen No. 1	Salesmen No. 2	Salesmen No. 3	Salesmen No. 4	Salesmen No. 5	Ma'n. Shop	Garage				Total Used for Day
Mon.																							
Tues.																							
Wed.																							
Thurs.																							
Fri.																							
Sat.																							
Mon.																							
Tues.																							
Wed.																							
Thurs.																							
Fri.																							
Sat.																							
Mon.																							
Tues.																							
Wed.																							
Thurs.																							
Fri.																							
Sat.																							

Total

Remarks_____

FORM IV: Four day book sheets like this are used by the garage superintendent to record the daily use of his supplies of gasoline, auto oil, transmission oil, and denatured alcohol.

TIRE RECORD AUTO TRUCK No._____

	Date Put On	Speedometer Reading	Date Taken Off	Speedometer Reading	Total Mileage Run	Kind of Tires
Right Front						
Left Front						
Right Rear						
Left Rear						

FORM V: How the truck tires are holding up in service with their guarantee is easy to follow by referring to the truck records.

This Form III, which is sent to the office, contains all the data gathered from the daily operation of the trucks which is required for the final operation costs.

The general manager desires figures on five operation costs: costs per day, per ton, per mile, per trip, and per stop. The cost per day includes only the daily operation cost. The cost per ton, per mile, per trip, and per stop are figured over a period of a month or more and takes in the overhead, upkeep repairs, and incidentals which cannot be put into the daily operation charges. For instance, it would not do to charge a tire to the daily cost of your trucks throughout the year. These upkeep charges are all made from the requisitioner of supplies and the depreciation costs are determined by the accounting department.

In addition to these three forms described, the garage superintendent keeps some other information for his own reference. The most important of these is his tire record (Form V). A separate record, keeping track of each individual tire, is kept for each truck. This shows whether the truck is getting the mileage guaranteed out of each tire. Also when two different tires are used the difference in mileage obtained shows up distinctly.

Besides this a day book is kept for gasoline, automobile oil, transmission oil, and denatured alcohol. In Form IV is shown its use for recording the daily distribution of the gasoline on hand. The requisitions from the various departments for each of these supplies enable the accounting department to charge properly any supplies sent outside of the garage. Automobile oil transmission oil, and denatured alcohol supply records are kept on similar sheets.

The striking feature of this plan is its simplicity. Three forms cover all records made on daily operation. Again these three forms are filled out by three different men, none of whom can complain of an excess of "red tape." All cost compiling is done in the accounting department along with the remainder of the firm's cost work. Besides these three, the garage superintendent keeps four supply records and a tire record, surely not enough to burden him with details.

Nazareth Cement Company Seeking Safety Trophy in 1930

The Nazareth Cement Company is a strong booster for safety practice, according to a statement by L. R. Rice, safety engineer for this company. On March 13, he wrote: "We have gone 330 days without a lost-time accident and we are making every effort to complete 1930 and win a trophy. We are centering our efforts on the working man, by bringing the safety thought direct to him. A careful physical examination of each employee is planned, to make him better fitted for the job. General mass meetings, foremen's dinner meetings, employees' general safety meetings and first-aid meetings are features of our monthly program."

Wage Rates and Labor Conditions in the Cement Industry in Europe

By FRANCIS MILTOUN

JUST as Henry Ford, through the International Labor Office at Geneva, is investigating the cost of labor and the relation of wages to the contents of the bread basket, it seems of pertinent interest to American cement makers that they should evaluate the exact part which European wages in their industry play in the low production cost, often half that current in the United States. That wages must form a considerable part of this cost is evident since raw materials are God-given and are usually worked up on the spot. Overhead charges, so far as they refer to government taxation, may in many cases be relatively higher in Europe than they are in America, but general production costs, based on mechanical processes, can hardly vary greatly save as the cost of combustible may be greater or less, hence the saving for the European manufacturer may be put down to the low pay-roll.

The author of the accompanying article, although living in Paris, is an American writer on European affairs. It is a distinct privilege to publish his opinions, for they are deduced from personal observations. In the September 11, 1929, issue of PIT AND QUARRY *Mr. Miltoun discussed the protection that is given by European countries to their respective cement industries. This discussion covers another angle of the industries which American operators can study to advantage.*

Not all this wage saving appears to show itself in home market and overseas selling prices, but the wage is low, nevertheless, and lowest of all in Germany and Belgium, the largest European producers of cement, and those exporting the greatest percentage of their product.

When it comes to selling European cement in foreign markets another cost factor is eliminated, at least considerably lessened, in that river, canal and rail transport often benefits the national industry from 10 per cent to even as high as 50 per cent in rebates. Freight on the high seas is quite a minor factor, too, once the cargo is embarked and gets started on its journey overseas. A three-, five- or eight-thousand-mile voyage of Belgian cement in a slow-going, economically manned and provisioned, sea-wallowing tramp schooner is not even so great a factor as might be supposed when it comes to delivering the product in Brazil, Panama, or Pacific Coast ports and comparing it with what delivery costs might be of American cement made in the east or middle-west headed for the same destinations.

Export rebating of the basic products of a country is nothing more nor less than a subvention in another guise, above all where transit communications are state owned as they mostly are in Europe. The danger is that a frankly export bounty might be clapped on the European cement industry to meet the new 6-cent duty recently proposed in the new American tariff revision. Chile does this with respect to nitrate; why not Belgium with cement? Belgium exports 51 per cent of its annual production of nearly three million metric tons. France has already tried the plan out with the export of bauxite ore but, for one reason or another, temporarily or permanently, has changed her tactics.

Just at the moment the League of Nations at Geneva, the mother organization, so to call it, of the International Labor Office, which has the wage investigation under way, has brought into being an international convention on Prohibitions and Restrictions of Exports and Imports, intended to do away with just these hidden "protections." The agreement was signed by various manufacturing and trading countries, including the United States.

The later Tariff Holiday agreement proposed by the League—not yet beyond the embryonic stage—suggests in its preamble a "search for substitutes which shall solve this problem of encouraging national production" by some other means than those outlined.

These points are emphasized at this time because all industrial Europe is looking more than ever to the "two Americas" to buy such commodities as it may have to offer, and several of these industrial countries of Europe have cheap cements to sell—portland, super and *fondu*.

Cement being what it is, a consumers' product, there is no necessity of creating the market. It already exists even in its world-wide aspect. In some producing countries output is below consumer demand; with others, often large producers in their own right, cement is also a commodity of export. There are also countries which are as well producers, exporters and importers. A consumers' product being something which is used and disappears (which is to say that it is not to be recuperated, nor something which is used to produce another commodity), it is more closely affected by the wage problem than otherwise it might be.

It may be taken for granted that all European manufacturing countries are stimulated to develop their foreign business, either by direct exportation to the United States or to markets which otherwise might be available to American manufacturers. In

1917 the United States bought of Belgium alone, the largest cement exporting country in the world, nearly a quarter of a million metric tons. At that time the price was approximately one-half dollar per hundred kilos in Belgium and considerably more than double that in the United States. And so were wages!

American automobile export may be satisfactory but that of cement is not. No one will deny that the United States door-yard markets of the Caribbean and Central and South America are as good as ever they were, though they have seemingly escaped the American cement manufacturer forever while he of Europe is getting the business. The low wage scale of Europe, more than anything else, appears to have made this change, though post-war redistribution of trade and the development of the industry accounts for much.

One fact stands forth: American wages and American production methods are decisively above those of Europe, and were so before Henry Ford and the Taylor system—the germ of which Taylor himself got of Europe. That Europe will some day imitate us there seems to be little doubt; meantime tariff barriers, even with tariffs consolidated and stabilized, may bring about a change before long.

The Tariff Truce conference, called by the League of Nations in February as such, is actually nullified, but its ghost will arise in the form of economic trade accords, bilateral or multilateral as the case may be, if European nations have their way between now and the end of the year. This tariff truce, had it gone through, would have pegged duties as they stood on October 1, 1929, having been proposed as a retroactive measure to prevent just such hurry calls as that which resulted in the increase on watch movements which brought a protest from Switzerland and that on cement which Belgium laments. The United States was apparently not interested in this conference beyond sending an observer from the Department of State who sat diligently, if statically, through the whole three weeks which it took to bury the project and resurrect that of stabilized and consolidated tariffs according to a French plan which is to be submitted to the governments of the world for ratification at some future time not too remote.

The following wage schedules in the cement industry are indicative of the first great benefit the European manufacturer has had bestowed upon him. Probably they are not given the part which wages and living costs are playing in the economical life of nations but they exist today. Sometimes the wage is reflected in the selling price of the product, sometimes not, but at any rate it represents what an old-time American merchant called the "first profit."

Sweden

Annual production .....500,000 Metric Tons
Annual export ..... 40,000 Metric Tons
Annual import ..... 10,000 Metric Tons

Wages and conditions of labor are governed by national agreement with and between the Building Materials Industry and the Swedish General Factory Workers' Union. The agreement also covers lime and clay products industries.

The wage scale is based on the hourly rate and varies by districts, of which there are three, not including the Stockholm district. The wages apply to able-bodied male workers over 18 years of age: District No. 1, $0.241; District No. 2, $0.227; District No. 3, $0.214. The classification of "skilled workers" receives another $0.013 per hour.

Night shifts and Sunday work are reckoned as ordinary hours. The working week is of 48 hours or, in exceptional instances, where authorization has first been obtained, continuous shifts of seven- or eight-hour stages run the week to 56 hours.

Piece work is paid according to the schedule prepared in agreement with each plant. Piece or task work in general is regulated on a basis which assures the pay exceeding that of the hourly rate by 25 per cent.

Overtime pay runs from 50 per cent on week days to Sunday overtime at 100 per cent.

Those who may have been employed for a year are granted 4 days holiday with pay.

Germany

Annual production .....7,275,000 Metric Tons
Annual export .....1,061,198 Metric Tons
Annual import ..... 144,312 Metric Tons

A collective agreement is in force between operators in the cement industry and workers therein for a wage running from $0.136 per hour for unmarried, unskilled workers down to $0.04 for minors of 15 years and $0.129 for those of 20 years of age.

The wage of female workers runs from $0.038 to $0.095 per hour.

In central Germany a zone scale of payment brings up the hourly rate of adult male workers from $0.131 to $0.145 per hour.

There is a growing tendency for wages to rise in the industry throughout Germany, but this has hardly exceeded 3 per cent except in spepcial instances. Hours of labor in general are 48 to the week. There is, moreover, a tacit agreement that a varying wage may be brought into being in accord with the varying scale of living costs as shown by the price index of the government.

Belgium

Annual production .....2,800,000 Metric Tons
Annual export .....1,639,000 Metric Tons
Annual import ..... 16,936 Metric Tons

The wage rate has been tabulated by the Brussels Official Labor Exchange with the following

(*Continued on Page* 55)

Physical Characteristics of Stone Sand and Its Successful Use*

By M. L. JACOBS
Bethlehem Mines Corp., Bethlehem, Pa.

NOT so many years ago it was not an uncommon sight in parts of the country where sand was scare and limestone of good quality plentiful, to see concrete being mixed using as fine aggregate varying amounts of stone dust mixed with sand. The amount of dust used depended usually on these factors: The availability of good concreting sand, the quality of the dust and the degree of acquiescence obtainable from the engineer or architect. I realize fully that many an engineer and architect would throw up his hands in holy horror at the idea but I know where there are a great many building foundations and heavy machinery foundations whose concrete has been mixed with a fine aggregate drawn directly from our dust bins. I am not recommending the practice, I am citing the fact. Of course there were failures in concrete mixed with dust, not, however, may I state, with dust that we supplied. The failures came from using a dust that carried so heavy a percentage of extremely fine material and dirt that concrete simply could not be made from it.

Some eight years ago our company built its first washing plant at our Bethlehem Quarry. The products of our Bethlehem Quarry are blast furnace flux, washed commercial sizes of stone and washed limestone sand. We found no difficulty whatever in disposing of the ordinary commercial sizes of stone from plus ⅝ in. up, but the sizes minus ⅝ in., i. e., our No. 1 stone, ¼ in. to ⅝ in., and our sand, minus ¼ in., began to accumulate. There has been a fair demand for the No. 1 stone but not enough to meet the production.

During our first two years of operation we met the strongest kind of opposition to the use of our sand for any purpose whatever. A great deal of this prejudice we found to be due to the fact that it did not look like sand. We were quite willing to agree that it did not look like ordinary bank or river sand and the question finally arose as to what is sand. The standard dictionary describes it as a grain or particle of rock material large enough to be easily visible to the naked eye but not so large as to be regarded as a stone or pebble. Clearly this definition embraced our product and we were justified in calling our product sand and not screenings as had been the common habit wherever the sand was seen. It took no small amount of persuasion to convince the engineers of our own company that we had a suitable fine aggregate for concrete. This difficulty with our own family made us realize that there is only one way to convince anyone and that is with irrefutable facts. Immediately we called in the engineers of the Testing Laboratory at Lehigh University and had them begin a series of tests. We had been confident that our product was as good as any commercial sand in our market for concrete work, but we had not assumed that it was better. The results of our laboratory tests were so much better than we had anticipated that we were actually surprised.

Using Standard Ottawa sand, Succasunna sand and Bethlehem Quarry sand in 1-3 and 1-2 mixtures we had the following results in seven days:

Ottawa		Succasunna		Bethlehem Quarry	
		Tensile Strength			
1–3	1–2	1–3	1–2	1–3	1–2
194 lb.	268 lb.	184 lb.	212 lb.	230 lb.	298 lb.
		In 28 Days			
305 lb.	450 lb.	250 lb.	363 lb.	573 lb.	584 lb.
		Compressive Strength			
		In 7 Days			
875 lb.	1,510 lb.	710 lb.	1,450 lb.	1,570 lb.	2,200 lb.
		In 28 Days			
1,620 lb.	4,155 lb.	1,670 lb.	2,790 lb.	4,120 lb.	4,965 lb.

These tests were made on samples taken by Mr. R. L. Fox, engineer of the City of Bethlehem. When Mr. Fox saw these results he concluded that he had found a material better than any sand previously available in this market. Several possibilities were presented. It was possible to use concrete made from this sand in seven days with practically the same strength obtainable with other sand in four weeks. It was possible to use a weaker cement mix and have the same ultimate strength in the concrete or it was possible so to design that thinner sections would do the same work. Subsequent tests by other laboratories have verified the above results. It will be of interest to note a screen comparison between Succasunna sand and Bethlehem Quarry sand.

Sieve Analysis of Aggregates

Per Cent of Sample Coarser Than a Given Sieve

Sieve Size	Size of Square Openings, in.	Succasunna Sand No. 1	Succasunna Sand No. 2	Limestone No. 1	Screenings No. 2
100 mesh	.0058	96.3	95.8	95.7	95.8
48 mesh	.0116	76.4	80.7	88.1	87.1
28 mesh	.0232	37.6	38.1	77.0	75.3
14 mesh	.0460	13.1	13.7	62.6	61.1
8 mesh	.0930	.2	.2	35.7	34.6
4 mesh	.1850	0	0	1.4	1.3
3/8 mesh	.3710	0	0	0	0
Fineness Modulus		2.23	2.28	3.60	3.55

	Succasunna Sand	Limestone Screenings
Per cent retained on 50-mesh sieve..	100	90
Per cent passing ¼-in. sieve.....	78	99

You will note that the fineness modulus of the Succasunna sand is 2.25 and that of Bethlehem sand is 3.57. The screen analysis tells the tale.

* Presented at the Thirteenth Annual Convention, National Crushed Stone Association, Cincinnati, Ohio, January 21, 1930.

The grading from fine to coarse in the Bethlehem sand is such that the greater strength is developed.

Armed with these fact we began to approach engineers and architects with real confidence in our product. The City of Bethlehem laid a new concrete pavement about three mils long and used our sand and stone. The combination of the washed stone and washed limestone sand gave a road that is better than that laid with any other aggregate in our locality. We at last had a sample to show. The sample was convincing and is more convincing today than it was five years ago.

The following summer one of our customers wrote us a letter which I am going to read to you.

Gentlemen:

I wish to call your attention to the enclosed sketch.

This sketch shows the condition of the 15th Avenue, Bethlehem concrete road after high pressure water main broke and washed out the ground under concrete road which we constructed last year. We had no idea the ground was washed out like this and had a 33-ton Erie steam shovel go over this section several times while working near there. After we dug up the concrete I was amazed to think this slab carried the shovel with such a span, so I measured the hole and had this sketch prepared.

This road was laid with your stone and stone sand, with the Pennsylvania State Highway specification of 1:2:3 mix and wire mesh.

I am convinced that concrete laid with your stone sand has considerably more strength than concrete laid with the regular sand, and am sending this sketch to you because I thought you might be interested in knowing this.

Yours very truly,
F. H. CLEMENT & CO.
(Signed) D. H. Brillhart,
President.

Next followed a motor-ramp garage in the neighboring city of Allentown. Sand for this job was sold to an engineer. The foundations for the twenty-three story Pennsylvania Power and Light Company's building in Allentown were poured with our sand specified in the concrete although we did not sell the stone. The ball had started rolling. We began one year with nearly forty thousand tons of sand in stock. We ended that year scraping the bottoms of the piles for sand to supply the demand. At no time in the past three years has our Bethlehem plant been able to meet the demand for this product.

Two years ago our Hanover washing plant went into operation and this year washing plants at our Steelton and Naginey quarries have begun production. The first thing we have done at each plant is to submit samples for analysis and tests to recognized engineering laboratories. The results have shown our sand to be uniformly better than that obtainable in any of our markets and we rest our hopes on the ability of engineers and architects to understand that point.

There is one feature of this product, however, that must be recognized. Due to the coarse particles this sand does not make a satisfactory mortar or plaster sand, but is suitable only for concrete. The finer sizes, of course, can be made but there is a resultant waste product which is commercially useless so far as we have been able to discover. However, the requirement for a more satisfactory concrete sand should absorb all the washed limestone sand that is made.

We have found in our experiments with this sand in the laboratory and in the field that the ordinarily accepted mixtures of 1-2-4, 1-2½-5 and 1-3-6 can be modified with benefit to the cost of concrete by increasing the amount of fine aggregate used in the mixture and decreasing the coarse aggregate. We find that some of our customers make the changes in proportions and secure a stronger concrete with a more satisfactory workability. Others used the regular specification mixes and seem to have little difficulty in making a smoother concrete without undue labor. The testing laboratory of the Pennsylvania State Highway Department has maintained that this workability factor is such that they cannot permit the use of our sand. The big idea with them is daily yield of completed road. They think the contractor will be held back if he uses a sand that requires any extra labor in finishing. It has not been the experience of contractors laying concrete roads in the cities of Bethlehem or Allentown that any extra labor is required with our sand. The finish is hard and even, although it has a roughness that adds materially to its non-skid qualities. The road rides comfortably and wears exceptionally well. There seems to be no measurable wear from year to year on streets laid with our sand, even under the heaviest traffic.

It is our thought that a satisfactory market can be developed for this sand by persistent citing of the facts to engineers and architects. Frankly we have had little difficulty with contractors. Our prices are good and they seem able to get a job that is satisfactory to their customers with our sand. We believe we should go on developing this trade and that it is profitable for us to do so. We are advertising this material and hope to see a continued growth of its use. I have some samples of our advertising matter that anyone interested may inspect.

Andalusite Minerals Important in Present-Day Industry

Andalusite, a little-known mineral which plays an important part in the making of the spark plug, vital in the automotive and aviation industries, comes mainly from the high altitudes of the Inyo Mountains of California, where it is transported in sacks by burros down a steep trail four and one-half miles long to the valley 6,000 feet below, says the United States Bureau of Mines, Department of Commerce.

The minerals—andalusite, kyanite, and sillimanite—differ in physical properties but have the same chemical composition. Although all three of these silicates of alumina are employed in industry they are often referred to indiscriminately as "sillimanite." Another mineral that is closely related to this group is dumortierite.

Long Aerial Tramway Carries Limestone to Cement Mill in Cascades

Superior Portland Cement, Inc. Operates Wet-Process Plant at Concrete, Wash.

By FRANCIS CHURCH LINCOLN
Professor of Mining, South Dakota School of Mines, Rapid City, S. D.

AT Concrete, in the fir-clad snow-capped Cascade mountains of Washington, in a locality justly proclaimed a sportsman's paradise because of its fine fishing, its deer, cougar, and mountain-sheep hunting, is located the plant of Superior Portland Cement, Inc. This plant keeps its latchstring out in true Western style. Witness its prospectus, which reads in part: "Superior welcomes you at Concrete! If you wish at any time to visit our cement plant, the Company's Club bids you welcome. Come as our guest. A cheerful chef prepares food to tease your appetite. Comfortable, quiet quarters at the Club and cottages adjoining. And, of course, you'll find a tour of the quarry and through the plant most interesting and instructive." Having enjoyed the hospitality of the Clinker Club and made the tour of the Superior quarry and mill, the writer will endeavor to impart to his less fortunate readers the information which he secured.

The first portland cement plant in the state of Washington was that of the Washington Portland Cement Co. at Concrete in Skagit County. Work upon this plant was begun on June 1, 1905; and it produced the first cement in May, 1907. The Superior Portland Cement Co. was formed in 1906. It built the second cement plant in Washington, also at Concrete, and began the manufacture of portland cement in 1908. The Superior plant originally employed the dry process of manufacture, but changed over to the wet process in 1917. Fuel oil was used as kiln fuel in the beginning, to be replaced later by pulverized coal. Limestone was first transported from quarry to mill by a two-mile standard gauge railway, but it is now carried by aerial tramway. In 1918 the Superior Portland Cement Co. purchased the Washington Portland Cement Co. and shut down its plant, thus becoming the oldest cement plant in operation in Washington and successor to the first cement plant in that state. Superior Portland Cement, Inc., was formed in 1925 for financing purposes and took over all the holdings of the Superior Portland Cement Co. In 1927 the number of slurry tanks was increased from 8 to 14, making possible greater flexibility of plant operation and better control of the raw mix; a new electrical system was installed, and the method of quarrying was changed from working a single, high face to working it in two benches.

Concrete is a town of about 1,000 population, lying on the west bank of the Baker River at its confluence with the Skagit River. The Superior mill is located within the town limits. The clay deposit is located half-mile distant on the east bank of the Baker River, not far from the dismantled plant of the Washington Portland Cement Co., which is also on the east bank. A short distance to the northward up the Baker River is the dam of the Baker River power plant of the Puget Sound Light & Power Co., which impounds a beautiful artificial body of water known as Lake Shannon. The Superior limestone quarry is on the south shore of this lake two miles from the cement plant. Superior Portland Cement, Inc., has its own hydro-

Clamshell handling limestone from open storage.

Electric shovel loading rock to quarry car.

Discharge terminal of aerial tramway at cement mill.

Tower along aerial tramway between quarry and mill.

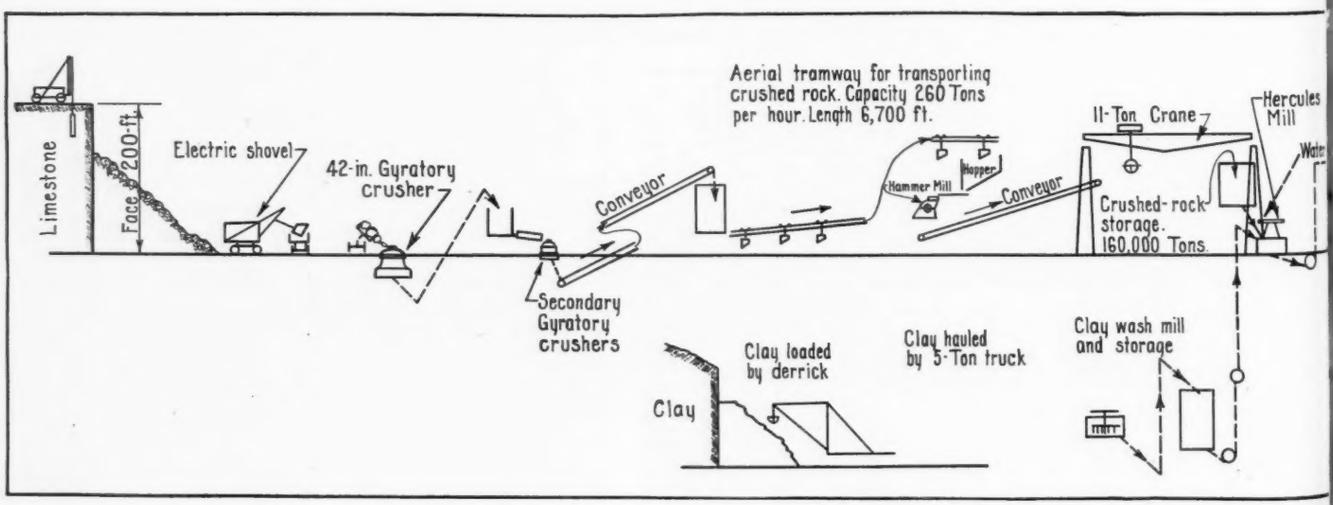
Dismantled plant of Washington Portland Cement Co.

electric plant situated eight miles north of Concrete, which generates most of the power consumed. The remainder is purchased from the Puget Sound Light & Power Co. Concrete is on the Great Northern Railway, 101 miles northeast of Seattle. As it is on the Skagit branch of this railway, 28 miles east of Burlington, which is on the main line of the Seattle-Vancouver Division of that railway, shipping facilities are good.

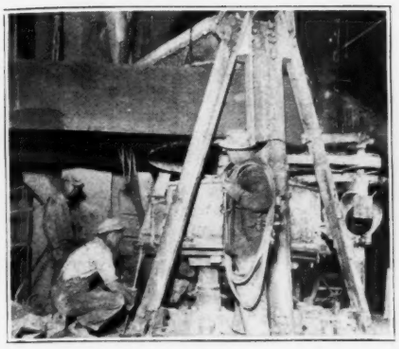
The limestone at the Superior quarry is a metamorphic rock occurring in steeply dipping beds of various colors and chemical compositions. The outcrop is 1,500 ft. in length by 1,200 ft. in width. The calcium carbonate content of these beds ranges from 55 per cent in a highly argillaceous phase of the limestone to 98 per cent in the purest beds. Although this limestone deposit is an extensive one, its presence was long unsuspected because of its covering of soil and timber. Sufficient stripping has now been done to uncover a 10 years' supply of limestone. The surface was first logged and then stripped by hydraulicking. An average of 4 ft. of overburden was removed by hydraulic giants, equipped with 1½-in. and 2-in. nozzles and supplied with water at 100 lb. pressure by a Goulds centrifugal pump with a capacity of 600 gal. per min. No stripping operations are being conducted at the present time.

The quarry is operated only 6 or 7 months during the year. The limestone deposit rises in a hill to a height of 440 ft. above the quarry floor. The quarry was opened with a single bench, but this became too high for safety and convenience in handling the rock, so the face is now divided into two benches. The lower bench is 208 ft. in height and about 1,500 ft. in length, while the upper bench is about 750 ft. long and will eventually reach a height of 232 ft. The coyote-hole system of breaking ground was given a trial, but its general use was abandoned for four reasons: it called for a large amount of secondary blasting, it left long sloping banks, it entailed danger to shovels and men from slides, and it produced an uneven quarry floor. Four-inch well-drill holes were tried unsuccessfully, their failure being ascribed to alternating hard and soft layers in the limestone. Eight-inch well-drill holes are now employed with success, being helped out by occasional coyote holes.

An Armstrong electric well drill located upon the lower, 208-ft. bench, sinks 8-in. holes to 8 ft. below the quarry floor. These holes are spaced 25 ft. apart and bored 35 ft. back from the quarry face. Coyote holes are employed when the rock is tight or the burden exceeds 35 ft. They are 30 in. by 30 in. in cross section and run from 5 ft. to 6 ft. above the quarry floor. The maximum burden shot is 60 ft. on the foot of the hole. The well-drill holes are loaded with 60 per cent du Pont straight dynamite for the lower 40 ft., followed in turn by 60 per cent and 40 per cent Trojan powder, and



Diagrammatic flow sheet of quarry and plant of



One of the preliminary grinding mills.

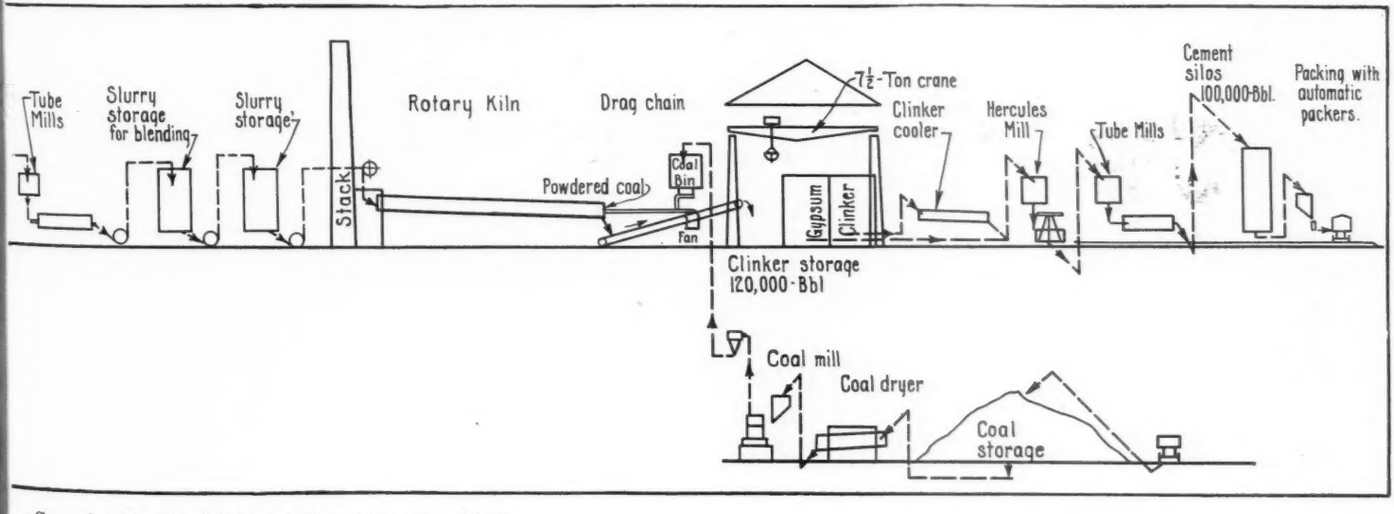
Well-equipped office at the plant.

Three-tube bagger in the packing house.

finally by 15 to 20 ft. of sand tamping. They are fired with Cordeau-Bickford safety fuse. As much as 200,000 tons is broken at a single blast. The upper bench is likewise drilled with well-drill blastholes and loaded and fired in a similar manner to the lower bench. The explosive throws about 75 per cent of the limestone broken upon the upper bench down to the quarry floor, the remaining 25 per cent being picked up and dumped off the bench by a No. 50B Bucyrus electric shovel. The coyote holes have powder pockets in their sides or bottoms which are loaded with black powder or with 20 per cent Trojan powder. When Trojan powder is employed, two boxes of 40 per cent Trojan powder are used as a primer. These holes are also fired with Cordeau-Bickford fuse, four loose No. 8 blasting caps being placed in each pocket. The average load of powder is ¾ lb. per cu. yd. of limestone. There are eight sinker drills in use for blockholing for secondary blasting, Chicago Pneumatic, Denver Clipper, and Ingersoll-Rand Jackhamer drills. They are supplied with air by two Ingersoll-Rand 14-in. by 12-in. air compressors, which are driven by 85-hp. General Electric motors. The secondary blasting is performed with 40 per cent du Pont gelatin dynamite in 1¼-in. by 8-in. sticks fired by fuse and No. 8 blasting caps. The quarry blacksmith shop is provided with an Ingersoll-Rand No. 25 forge and an Ingersoll-Rand Type 50 drill sharpener for sharpening the blockholing drills.

Loading the broken limestone on the quarry floor is performed by a No. 120B Bucyrus electric shovel, which is operated by two men, one on the shovel and one in the pit. The rock is loaded into 12-ton Western side-dump quarry cars, of which twelve are available, and hauled to the crushing plant in trains drawn either by a 20-ton Plymouth gasoline locomotive or by a 24-ton American steam locomotive. The quarry cars dump directly to the primary crusher at the crushing plant, which is adjacent to the quarry. The crushing plant is arranged in such a manner that it is possible to dump the broken limestone directly to the secondary crusher in case anything goes wrong with the primary crusher.

The primary crusher at the limestone quarry crushing plant is a 42-in. Traylor gyratory crusher, driven by a 260-hp. Allis-Chalmers motor, and one of the secondary crushers is a 12-in. Traylor gyratory. The limestone which is dumped upon the primary crusher from the quarry cars is reduced by it to fragments of 8-in. maximum diameter. A Link-Belt bucket elevator composed of 48-inch by 18-in. by 24-in. buckets and driven by a 100-hp. Westinghouse motor, raises the coarsely broken limestone to the top of a distributing bin of 150



Superior Portland Cement, Inc., Concrete, Wash.

tons capacity. In the bottom of this bin there are four chutes which direct the rock to five Traylor Sheridan eccentric-bar grizzlies with 2½-in. spaces between bars. These grizzlies feed their oversize to the four secondary crushers, while their undersize is by-passed to a belt conveyor. Two of the secondary crushers are No. 4 and two are No. 6 Gates gyratories. All are set to deliver a product of 2½-in. to 3-in. maximum diameter. A 30-in. Goodrich cross-conveying belt driven by a 20-hp. Allis-Chalmers motor catches the undersize from the grizzly feeders which has by-passed the secondary breakers together with the crushed product of these breakers, and delivers these products together to another 30-in. Goodrich inclined belt conveyor, 350 ft. center to center, and driven by a 40-hp. General Electric motor. The material upon this inclined conveyor belt is raised to the loading bin of an aerial tramway.

The crushed limestone is transported from the quarry to the cement plant by an aerial tramway with a capacity of 260 tons per hour. This tramway is of the Trenton-Bleichert double-rope type and was designed and manufactured by the American Steel & Wire Co. It is 6,671 ft. in length with a net fall of 215 ft. The tramway crosses the Baker River and surmounts two summits, upon each of which the line is vertically curved. The highest summit is 420 ft. above the discharge terminal. An average of 10 hp. is required to operate the tramway, which is equipped with a 30-hp. motor that is sometimes pulling and sometimes braking. The drive is through an 8-grip sheave at the loading terminal. The loading bin is a cylindrical reinforced-concrete bin with a capacity of 1,000 tons. This bin is provided with four chutes in its side which are drawn through convex arc gates operated by compressed air. One operator is kept busy loading buckets. The buckets are of 30-cu. ft. capacity and hold 3,000 lb. of limestone. There are 88 buckets in use, three of which are always waiting at the loading station. The buckets are spaced by a second operator at about 157-ft. intervals and are run at a speed of 450 ft. per min. The track cables are 1⅝-in. and 1-in. locked coil cables on the loaded and empty sides, respectively, and are installed with a gauge of 10 ft. The haulage cable is a 1-in. crucible steel Seale

Aerial view of Concrete, Wash. The cement plant is at the lower left. Note the towers of the tramway leading to it from the quarry on the lake.

View of the two rotary kilns looking toward the feed ends.

Face of the limestone quarry near Lake Shannon.

One of the six rotary kilns used in burning.

Patent lang-lay rope. Where the tramway crosses the highway, heavy wire net guards are suspended below it to prevent possible injury to passing traffic. The aerial tramway buckets dump automatically into the hopper of a swing-hammer pulverizer at the cement plant.

The clay deposit at Concrete lies upon the banks of the Skagit and Baker Rivers and consists of horizontal strata about 30 ft. in total thickness and of considerable lateral extent. The clay was brought to its present position by the waters of the Skagit and Baker Rivers, which derived it mainly from glacial drift.[1] Some of the clay layers are sandy, but the general composition is: silica, 56-57 per cent; ferric oxide, 8-9 per cent; alumina, 15-16 per cent; lime, 5-6 per cent; and magnesia, 4-4½ per cent. On account of the high clay content of some of the strata of limestone in the Superior limestone quarry, it is possible to make combinations of different beds of limestone from that quarry which will have the desired composition for the manufacture of portland cement, so but little straight clay is used. The Superior clay quarry is located beside the road to the limestone quarry at a point half-mile distant and across the Baker River from the cement plant. The clay is drilled with clay augers and shot down. It is loaded into a 5-ton Kenworth motor truck by means of an American derrick equipped with a Hayward Class E 1-cu. yd. clamshell bucket. The truck transports its load of clay by road to a 1,000-ton clay storage pile at the cement plant. An excavator equipped with a ½-cu. yd. Blaw-Knox clamshell bucket, recovers the clay from this storage pile and delivers it to a homemade wash mill where it is mixed with water and disintegrated. From the wash mill, the disintegrated clay passes to two 16-ft. by 20-ft. clay storage tanks, from which it goes to the raw grinding mills where it is mixed with limestone and water to form a slurry.

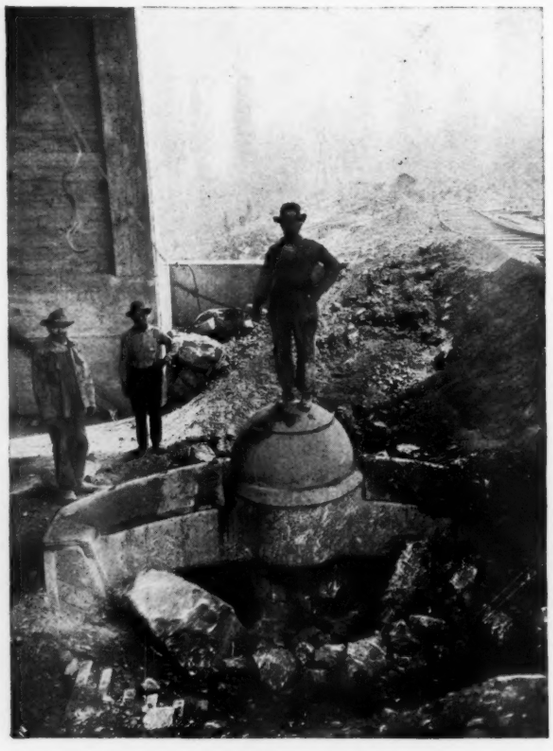
[1] Shedd, Solon, *Cement Materials and Industry in the State of Washington*, Bull. 4, Wash. Geol. Survey (1914), p. 222-3.
Roverts, Milnor, *The College of Mines Series of Ores, Coals, and Useful Rocks of Washington*, Bull. 10, Wash. Geol. Survey (1917), p. 21.

The limestone, which has been broken to fragments of 3-in. maximum diameter at the quarry and brought by aerial tramway to the cement mill, is there dumped into the hopper of a No. 6 Williams Mammoth swing-hammer pulverizer driven by a 200-hp. General Electric motor and reduced to pieces of 1-in. maximum diameter. The product of the swing-hammer mill is carried by a 30-in. Goodyear conveying belt to a 160,000 limestone storage pile. Samples of limestone are taken regularly from the material on this belt conveyor. Limestone is reclaimed from the storage pile by an overhead electric crane assisted by an electric shovel. The crane is an 11-ton Shepard equipped with a 4-cu. yd. No. 635 Blaw-Knox clamshell bucket; and the shovel is a No. 30B Bucyrus equipped with a 1-cu. yd. Blaw-Knox clamshell bucket. These machines deliver the limestone to a 200-ton capacity concrete bin above the coarse raw grinding mills. Two Bradley-Hercules revolving-disk feeders beneath this bin are driven by 2-hp. United States motors and deliver their feed to two Bradley Hercules mills which are driven by 300-hp. General Electric motors. Clay from the clay storage tanks and water are also fed to these mills as the requirements may demand. The coarse slurry produced in the Hercules mills is pumped to an agitator trough whence it is distributed to six 6-ft. by 22-ft. tube mills for finer grinding. Three of these tube mills were supplied by the Allis-Chalmers Manufacturing Co. and three by the Power & Mining Machinery Co. The tube mills are driven by individual 250-hp. motors of Allis-Chalmers, General Electric, and Westinghouse makes. The finished slurry from the tube mills is raised by an 18-in. by 10-in. by 10½-in. Webster-Brinkley Supply Co. bucket elevator and Wilfley pump to any one of six 2,500-bbl. blending tanks; and from these passes to any one of eight 16-ft. by 36-ft. cylindrical concrete kiln-feed tanks. From these kiln-feed tanks, the slurry is raised to the slurry feeders of the kilns, the overflow returning to the tanks.

C. L. Wagner, general superintendent, Superior Portland Cement, Inc.

There are six kilns in the Superior cement plant, and they have a combined capacity of 5,200 bbl. per day. Each kiln is provided with its own kiln-feed tank and homemade ferris-wheel slurry feeder. The kilns are of two different makes and sizes, three being 8-ft. by 7-ft. by 135-ft. Mosser kilns and three being 9-ft. by 8-ft. by 192-ft. Allis-Chalmers. These kilns are driven by individual 25-hp. and 75-hp. General Electric and Allis-Chalmers motors. Pulverized coal is used as fuel. The three large kilns are equipped with F. L. Smidth chain dryers for facilitating the transfer of heat to the slurry in the drying zone of the kiln. This system consists in the suspension of heavy chains inside the kiln as chords of arcs for a distance of 43 ft. from the feed end of the kilns. A 9-ft. Chain Belt Rex drag-chain conveyor driven by a 15-hp. General Electric motor transports the clinker from the kilns to the 120,000-bbl. clinker storage. The clinker is reclaimed from storage by means of a 7½-ton Shepard electric crane equipped with a 2½-cu. yd. Blaw-Knox Speedster No. 130 clamshell bucket. This crane delivers the clinker to a shaker feeder which loads an 18-in. by 10-in. by 10½-in. bucket elevator which raises it to a 5-ft. by 50-ft. rotary clinker cooler. The cooled clinker is delivered to a second similar bucket elevator, in which the desired amount of gypsum is added to the clinker from a 1,000-ton gypsum storage bin in the clinker storage section. The gypsum used is purchased either from the United States Gypsum Co. at Lewistown, Mont., or from the Standard Gypsum Co. of Seattle. The bucket elevator then raises the clinker and gypsum to a bin above the coarse finish-grinding mills. Additional clinker storage for the winter months, having a capacity of 250,000 bbl., is provided outside the regular clinker storage already noted. The clinker in this storage is handled by a Koehring heavy duty convertible gasoline power shovel and crane which ordinarily employs a ½-cu. yd. Blaw-Knox clamshell bucket, but which is also equipped with a ⅝-cu. yd. dipper.

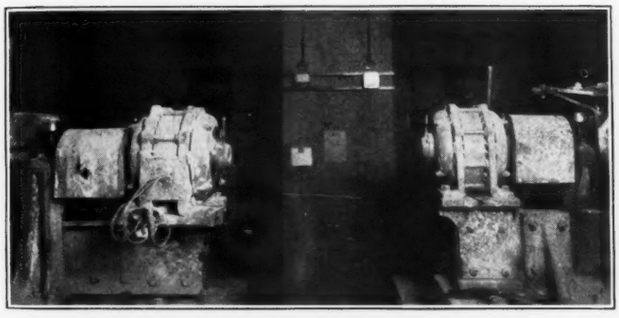
The coal used as kiln fuel is a sub-bituminous coal which is purchased from the Bellingham Coal Co. It arrives at the plant in bottom-dump cars which drop their contents into a track hopper. From this hopper the coal is raised by a No. 1130 Link-Belt conveyor to a 1,500-ton coal storage pile. The coal is reclaimed from storage by a 16-in. screw conveyor and elevated to the feed bin of the rotary dryers. There are two rotary dryers—one 15 ft. by 50 ft. and one 7 ft. by 75 ft., both having been designed by the Superior staff. They reduce the moisture content of the coal from 10 per cent



Primary gyratory crusher at the Superior quarry.

to 5 per cent. The dried coal is then elevated to the feed bin of four 5-roller Raymond mills. Pipes from the tops of the Raymond cyclones lead to the fans supplying air to the kiln feeds, and in this way the fine coal dust is burned to advantage instead of collecting and forming a nuisance and menace about the plant. There are six pulverized coal bins, one for each kiln. The pulverized coal is drawn from these bins by screw conveyors and delivered to individual Fuller-Lehigh Bailey kiln feeders. The consumption of fuel is lessened by pre-heating the air by passing it over the clinker and then drawing the heated air into the kilns with the pulverized coal. Brown kiln pyrometers are provided and a kiln temperature of 2,700 deg. F. is maintained.

The coarse finish grinding, like the coarse raw-grinding, is performed by two Hercules mills driven by 250-hp. and 300-hp. General Electric motors, respectively. Their product is delivered



Motors which drive the feeders to the grinding mill.

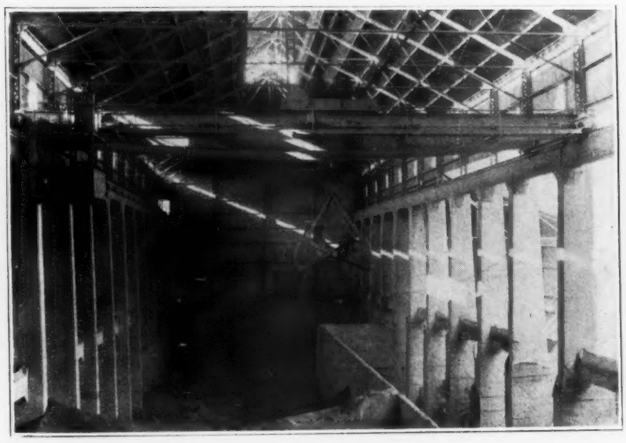
by elevator and screw feed to eight fine finish-grinding tube mills, four of which, as in the case of the fine raw-grinding tube mills, were supplied by the Allis-Chalmers Manufacturing Co., and four by the Power & Mining Machinery Co. This plant has a capacity of 7,200 bbl. of finished portland cement a day. A homemade, screw-conveyor elevator and Gutta Percha belt conveyor transport the finished cement to the silos which have a capacity of 100,000 bbl. of portland cement. Cement is shipped both in sacks and in bulk. A 3-tube Bates

Locomotive and car receiving load in quarry.

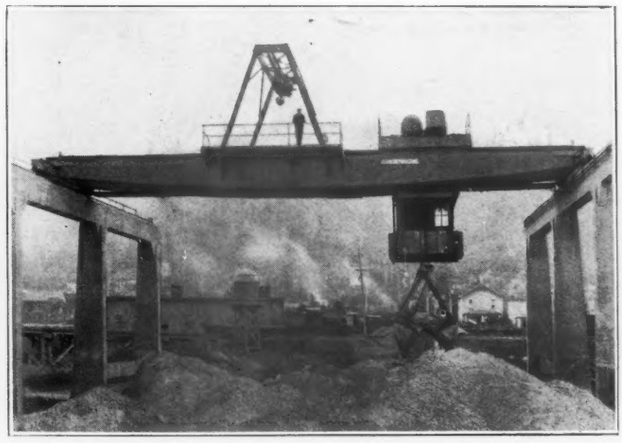
bagger is employed for sacking cement, and bulk shipments are weighed on Fairbanks-Morse track scales.

The quarry is operated by one shift for from six to ten months during warm weather; but the cement plant is run continuously, regulating its output by the demand. When in full operation about 200 men are employed, the average number of employees being 160. A men's club is operated for employees and group insurance is taken out for them. Accidents have been very few in number and very slight in nature during the past few years and the company received honorable mention in the U. S. Bureau of Mines Safety Contest year before last. It is interesting to note the length of time many of the employees have worked for the company. There are 19 on the payroll who have served the company for over 20 years, 19 more who have served over 15 years, 24 over 10 years, and 52 over 5 years, making a total of 114 who have been in the employ of the company for more than 5 years.

C. L. Wagner is vice-president in charge of operations and general superintendent of all operations at Concrete. He began work for the company as assistant chemist in 1911 and was shortly afterward made chief chemist. He became general superintendent in 1925. He is assisted in his work



Traveling crane in the clinker-storage building.



Crane over open storage of crushed limestone.

Chester N. Reitze.

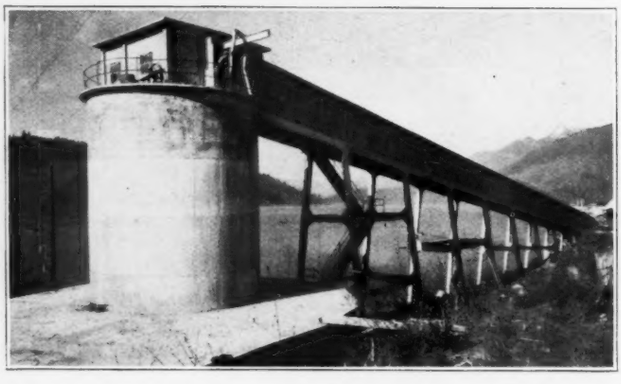
Gordon Tongue.

George E. Dickinson.

by a staff all of whom have been with the company for many years. H. A. Ambler is superintendent; J. B. Brooks, assistant superintendent; E. M. Buchanan, chief chemist; Wm. Woodworth, chief electrician; George A. Campbell, auditor; and John O. W. Applegren, geologist and engineer. The sales offices of Superior Portland Cement, Inc., are located in the Seaboard Building in Seattle. Edwin P. Lucas is president; Chester N. Reitze, vice-president and general manager; George E. Dickinson, vice-president and secretary; and Gordon Tongue, treasurer and sales manager.

Edwin P. Lucas.

Conveyor in gallery from quarry crusher to loading bins of aerial tramway.



Loading terminal of aerial tramway and conveyor from quarry crusher.

Maintaining Interest in Safety Meetings in Hazardous Summer Months

By W. DEAN KEEFER
Director, Industrial Safety Division, National Safety Council

WITH the coming of warmer weather it may be just a little harder to keep up the attendance of the regular monthly safety meetings of the plant. But this fact should act as an additional challenge to all persons in your plant who share the responsibility for your safety program. Since certain kinds of accident hazards increase rather than decrease during the summer months, a special effort should be made to maintain interest in your safety meetings.

Is it difficult to keep up interest in safety and accident prevention in the summer months? At least one industry—cement—has found that a No-Accident campaign in the month of June each year not only makes that month the lowest in the year so far as accidents are concerned, but the general momentum of the safety idea is carried over into the following summer months. The author of this article points out some timely and valuable ideas on keeping the accident rate down during the warm days of the year.

One of the secrets of maintaining continuous interest in safety meetings is to make the meetings seem so impoprtant that no worker can afford to miss them. It is a decided advantage, of course, to establish the regularity of plant safety meetings, regardless of weather or competing attractions.

Experienced safety men agree that safety meetings of various kinds are necessary to arouse and maintain the interest of superintendents, foremen and workers in accident prevention. There can be no doubt that safety meetings provide excellent opportunities to educate those in attendance, and they also influence these men in assuming their share of responsibility in determination of safety plans and in seeing that these plans are fulfilled.

There is difference of opinion, however, as to such questions as to the following: Should meetings be held after working hours? At what hour should safety meetings be held? Where should these safety meetings be held? How shall those who are expected to attend be notified? What percentage of those who are invited should be expected to attend? How can we change our programs to increase the interest in our safety meetings?

These are questions which probably have already been considered, but if meetings are not as well attended as they should be, possibly some of these questions are worth reconsideration.

In the continuing of our suggested programs of monthly meetings, we wish to suggest, as the new chief topics for your June safety meetings, that you have "Special Remarks by the Sales Manager," and that you give special consideration to the topic of "Safety Posters."

The chairman of your safety committee should notify your sales manager in advance that he will be called upon to tell "What Safety in Our Plant Means to Our Sales Department." In discussing this subject, your sales manager will no doubt want to emphasize such topics as the following:

(1) One or more serious accidents may so interfere with our production that our company cannot make delivery on certain orders within the time limits specified by the purchaser.

(2) Such delays may make it necessary for our company to make a price concession on our sales; or the purchaser may refuse to accept the shipment.

(3) The cost of accidents must be included when setting the sales price of the products of our company. If our accident costs are excessive, the sales prices may be excessive, and our company may thus lose the business to its competitors.

Perhaps your sales manager will be able to recall certain experiences of your own company or other companies to illustrate these points.

"Safety Posters" should be a very interesting topic. It is generally acknowledged that the use of pictures and stories, to tell the workman what he must do to protect himself and others from injury, is one of the most effective means of getting results and maintaining interest in plant safety work.

Many persons are injured because of ignorance, indifference or carelessness, and continuous education is, therefore, absolutely necessary to secure their whole-hearted cooperation in the reduction of plant accidents. It is virtually impossible, of course, to carry on this educational work with each man personally. Therefore, attractive safety posters and a live safety bulletin board offers one of the most practical solutions of this problem.

The safety committee should discuss some or all of the questions listed below. If desired, one or more sub-committees may be appointed to make a survey of certain departments, or of the entire plant. The reports of these committees might be based on the following questions:

Are our safety posters merely tacked up on a wall or a post, or some other convenient place?

Are they displayed in an attractive setting, to tempt our workers to read them?

Are our bulletin boards effective?

Are our bulletin boards properly illuminated either by daylight or by electric lights?

Are our bulletin boards placed in proper locations?

Is some one man responsible for our bulletin boards?

Are too many posters displayed at one time?

Are our posters changed frequently?

Are posters sometimes used that do not refer to our own work?

Are homemade posters used from time to time?

Do we sometimes display goggles broken in service, etc.?

What types of posters are most effective?

The chairman of the safety committee should make advance arrangements with some local person, such as the chief of police, the secretary of a local automobile club, or a representative of a street car company or steam railway company to speak on the topic of "Automobile Safety." As the basis for such remarks, he probably will know that there were in the United States for the year 1929 a total of 31,400 deaths from automobile accidents, according to estimates of the statistical department of the National Safety Council. The attendance records of many industrial establishments show that workers lose more time because of accidents outside of the plants than as the result of plant accidents.

There are three major means for the prevention of motor vehicle accidents. These are engineering, education and enforcement.

"Caring for Injured Workers" also should be a very interesting topic. First-aid work is intended to do two things: (1) To provide for the treatment of minor injuries that do not require the services of a physician, and (2) to fill the gaps between the occurrence of an accident and the arrival of a physician or an ambulance.

The safety committee should, from time to time, check up to see that the right equipment is provided and the proper organization is maintained to care for each injured worker immediately following the occurrence of an accident.

The safety committee should discuss all of the following questions. If desired one or more subcommittees should be appointed to make a survey of certain departments or of the entire plant. Reports of these committees might be based on the following list of questions:

1. Is suitable first-aid equipment provided at proper places throughout our entire plant?

2. Is someone personally responsible for maintaining these first-aid supplies?

3. Are nurses or workers trained in first-aid available at all times in all parts of our plant?

4. Are stretchers provided to carry injured workers to first-aid stations, to ambulances, etc.?

5. Are the names, addresses and telephone numbers of several doctors posted at first-aid stations so there will be no delay in securing a doctor in an emergency?

6. Are the isolated groups of our plant properly equipped and trained for administering first aid?

7. Are our workers educated to report all injuries, no matter how slight, for immediate care?

8. Is it advisable to organize first-aid instruction classes for our workers?

These special topics for June and July afford special opportunity for possible displays, to increase interest in these meetings. For example, a display of some of the most novel and important safety posters that have been used in the plant should attract a great deal of attention. The topic of "Caring for Injured Workers" would afford a splendid opportunity for a first-aid demonstration by one or more first-aid teams of the plant. Motion pictures and lantern slides also may be used to good advantage.

Suggests Cork as Noise Eliminator for Cement Machinery

By W. F. SCHAPHORST

Sometimes the vibration of cement machinery causes considerable noise and distress, and the question is asked: "How can we stop this vibration?"

One concern of my acquaintance decided the best thing to do was to lay a heavy foundation under the machine—so heavy that the comparatively small machine would be unable to cause the heavy mass to vibrate with the machine. This machine was on a second floor. The heavy foundation installed was made of lead. The method "worked" but there are two objections to that method. First, it is an expensive method. Second, it is sometimes impossible to increase the load on a second floor without adding reinforcing columns underneath. It so happened that in this instance additional columns were not required.

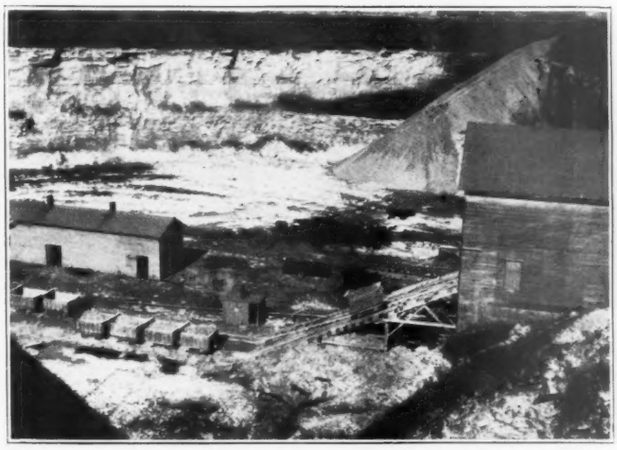
The best method I know of for eliminating vibrations of this sort is the use of cork board. By using cork, vibrations may be eliminated "scientifically." Do not distribute the weight over a large area of cork, however. The area must be restricted so that the cork will be under the right amount of compression. Sometimes cork of different densities are used. Sometimes heavy concrete foundations are poured directly on top of cork board, and the sides of the foundation are lined with cork of proper thickness and density. The weight of the foundation plus the weight of the machine are calculated to give the cork the proper amount of compression. Vibration is thereby eliminated.

Cork board is ideal for this purpose because it is strong in compression, is highly elastic, is surprisingly durable, and does not rot. The fact that cork weighs so little per cubic foot is its great advantage for use on second floors.

Lima Stone Co. Hauls Raw Materials to Plant Through Two Tunnels

Produces 3,000 Tons of Crushed Stone Daily for Highway Construction Work

THE plant of the Lima Stone Co., at Lima, O., has several features which make it of unusual interest. The quarrying operations are unique in that the stone is hauled through two tunnels before it arrives at the plant. All sizing of stone is done by vibrating screens. The plant and property are located within the limits of Lima, a town of over 50,000 population, less than a mile from the heart of the city. The plant has a capacity of 3,000 tons per day, most of which is shipped by rail for macadam and concrete road work.



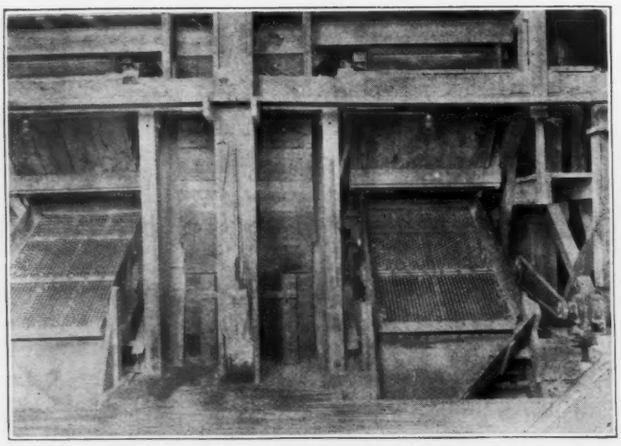
Loaded car being hauled up incline from quarry to plant.

When the plant started operations in 1908 it was outside of the city limits of Lima and apparently had ample space for expansion. Production increased rapidly, however, and in 1912 it became necessary to open a new quarry. The first quarry was bounded on one side by a paved city street, on another by a creek and on the other two sides by the main line of the D. T. & I. Railway and switching tracks of the same road.

The second quarry was connected with the first quarry and plant by a 100-ft. tunnel under the side-track. This quarry was exhausted in 1925 as it was bounded by the same creek and D. T. & I. main line, the switching track and the main line of the Pennsylvania Railway.

The third quarry was then opened adjoining the second and connected to it by a 400-ft. tunnel which crosses diagonally under the intersection of the main lines of the Pennsylvania and D. T. & I. railways. Stone is now being hauled a distance of about 2,000 ft. and through these two tunnels to the plant. As the same creek previously described bounds the third side of this quarry, there is room for expansion in

Shovel loading cars in quarry. D. T. & I. Ry. right-of-way at left. Well drills in background.



Four of the vibrating sizing screens.

Well drills and protecting dike in background.

only one direction, but this should furnish an ample supply of stone for fifty years to come.

The overburden at the quarry averages about 5 ft. in depth and is removed by contract. Drilling is done by two Loomis Clipper electric well drills using 6-in. bits. The full face of 50 ft. is shot down in single row bank shots generally consisting of from 3 to 5 holes. Shots of as high as 32 holes have been made. Hercules 40 per cent dynamite is used. Due to the stratified formation of the rock, no secondary drilling is necessary. The yield is about 5 tons per pound of explosives.

The stone is loaded by a Bucyrus 100B full-revolving, crawler traction electric shovel with a 3-cu. yd. dipper into 5-cu. yd. Watt Car and Wheel Co. steel end-dump cars. This shovel was installed less than a year ago. There is also a Marion Model 50, flat-wheel, chain-driven steam shovel of 2-cu. yd. capacity which is kept in reserve for an emergency. The cars are hauled, 6 to 10 cars in a train, to the plant by a 27-ton Lima Shay type steam locomotive and an 18-ton Lima saddle-tank steam locomotive. The track is 36-in. gauge.

The present quarry is 50 ft. deep while the two older quarries are 63 ft. deep. The drainage is taken care of by a slope in the tunnel connecting the present quarry with the second one, the water from both quarries going to a sump. An Ashton No. 3 centrifugal pump discharges it into the creek. Some of this water also drains into the old quarry adjoining the plant. Two centrifugal pumps discharge this water into the creek at different points. The creek runs by the present quarry at the same level as the top of the rock deposit and an earthen dike keeps the water out of the quarry.

Shovel loading cars in quarry. The two well drills are visible in background.

Plant from southwest, office at right.

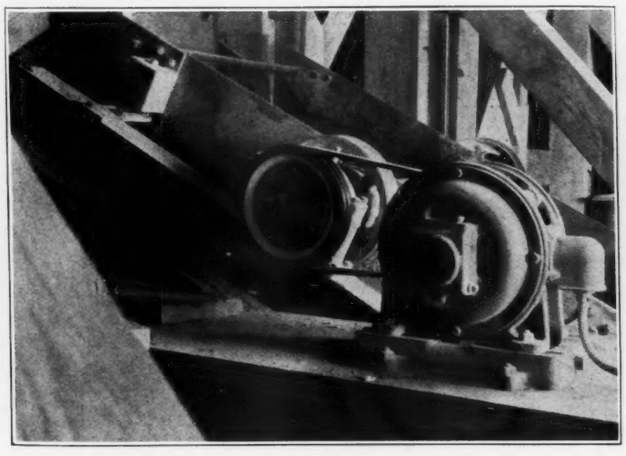
Plant from southeast—office left, machine shop right.

The cars are hauled, one at a time, up an incline at the plant, by a Power & Mining single-drum hoist driven by belt and friction by a 100-hp. General Electric motor. Roebling cable is used. The cars dump directly into the Worthington No. 30 Superior gyratory primary crusher which is belt-driven by a 150-hp. General Electric motor. The crusher discharges to a 42-in. Allis-Chalmers chain bucket elevator on 108-ft. centers which, in turn, discharges into a 62-in. by 14-ft. Allis-Chalmers jacketed revolving scalping screen. This has 3-in. round perforations on the main barrel and 1-in. on the 8-ft. jacket. The screen is belt-driven and the elevator is gear-driven from a shaft which is belt-driven by a 100-hp. General Electric motor.

The material over 3-in. goes through a chute to two Allis-Chalmers No. 6 Superior reduction crushers. These discharge to a belt bucket elevator which feeds the vibrating sizing screen. The 3-in. to 1-in. and the 1-in. and under stone from the scalping screen goes directly to the same elevator to the vibrating screens. The elevator is belt-driven by a 125-hp. General Electric motor.

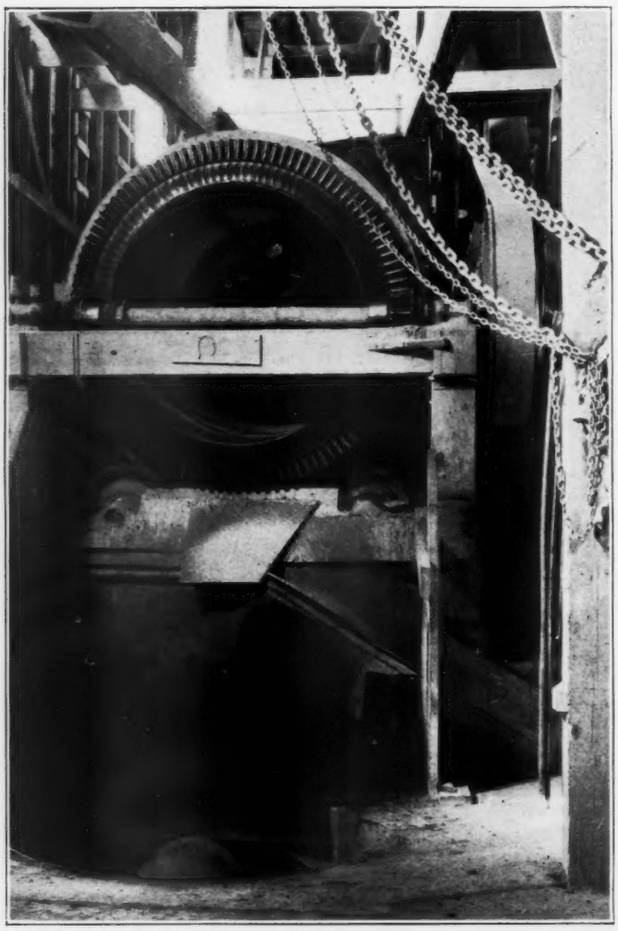
This elevator discharges through a split chute to two Niagara 4-ft. by 6-ft. double-deck vibrating screens. These have 2⅜-in. mesh cloth on the top deck and 2-in. on the bottom deck. The material over 2⅜ in. goes through a chute to two Allis-Chalmers McCully No. 3 and a Gates No. 4 gyratory crushers. These are fed through a split hopper and all discharge into the same belt bucket elevator feeding the vibrating screens. The two No. 6 and one of the No. 3 crushers are belt-driven from a line shaft by a 150-hp. General Electric motor. The other No. 3 crusher is belt-driven by a 20-hp. General Electric motor and the No. 4 crusher by one of 30-hp.

The 2-in. to 2⅜-in. material is chuted direct to bins and that under 2-in. goes to two Niagara 4-ft. by 8-ft. double-deck vibrating screens. These two screens are placed immediately below the first set and inclined in the opposite direction. This set of screens has 1-in. mesh cloth on the upper deck and



One of the vibrating screens for special sizing.

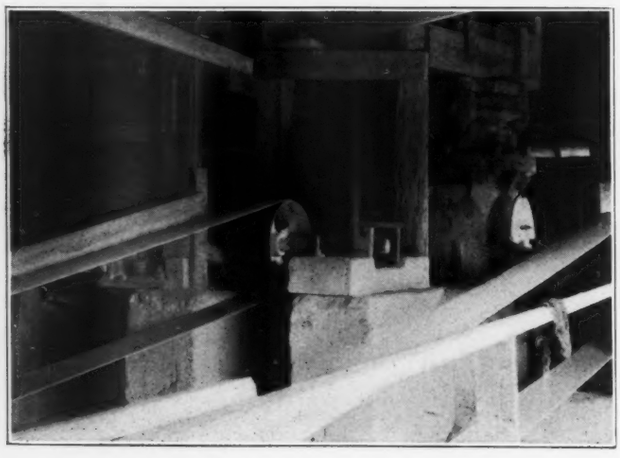
Transformer house from which entire plant is controlled



The revolving scalping screen with crusher in foreground and elevator from primary crusher in background.

3/16-in. on the lower. The oversize 1-in. to 2-in., the 3/16-in. to 1-in., and the minus 3/16-in. sizes all go direct to bins.

The 3/16-in. to 1-in. stone from the last set of screens can, if desired, be run onto two Niagara 4-ft. by 6-ft. single deck vibrating screens with ½-in. and ¾-in. mesh cloth respectively. These screens produce chips used as top dressing for macadam or other water-bound roads. The screens are all driven through 2-strand Texrope drives by



Two of the gyratory reduction crushers.

General Electric motors, 5-hp. being required for the double-deck and 4-hp. for the single deck screens.

The ten wood and concrete bins have a total capacity of 3,000 tons. They are arranged in two rows of five bins each, with a concrete tunnel under each row. Trucks are loaded under one row and railroad cars under the other through sliding gates. A small friction-hoist driven by a 75-hp. motor is used for spotting cars under the bins.

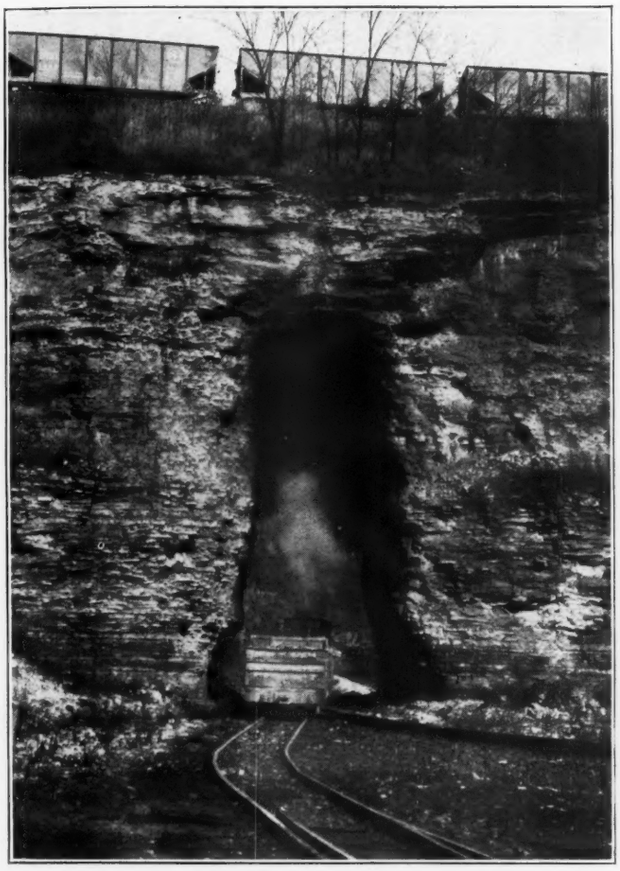
All possible precautions are taken to prevent delay through breakdowns. Over the primary crusher traveling on steel beams is a 25-ton capacity Yale & Towne traveling chain hoist for handling repair parts. A 2-ton Wright chain hoist is used for a stone hook and a similar hoist is over the car dump. A 4-ton and a 6-ton chain hoist in

Plant from the quarry level. Locomotive house at left.

the main plant handle parts for the No. 6 crushers, the scalping screen and the chain bucket elevator.

A small building adjoining the plant houses an Ingersoll-Rand 14-in. by 12-in. air compressor which is belt-driven by a 100-hp. General Electric motor. Crane valves and fittings are used on the air line. A warehouse nearby has a large stock of repair parts which insures against delay through minor breakdowns. There is also a blacksmith shop which is equipped to make any minor repairs. All of the buildings are of wood-frame construction with concrete foundations.

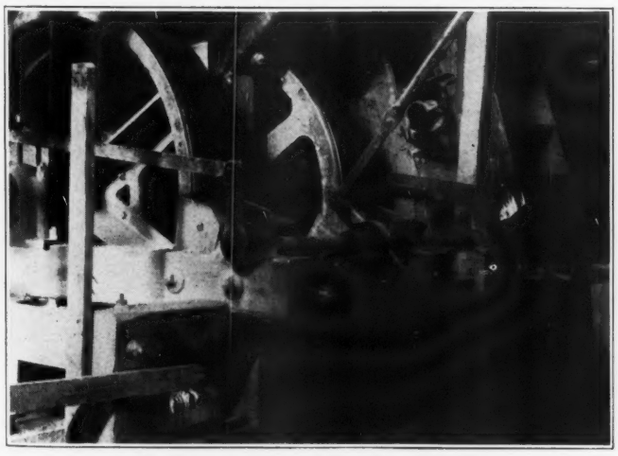
The plant of the Lima Stone Co. is typical of others operated by wide-awake producers who are keeping abreast of the times by replacing old or obsolete equipment with the more efficient and eco-



Trainload of stone being hauled through one of the tunnels. Note cars on track above.

nomical machines of the present day. Although this plant has been producing for more than twenty years, its equipment compares favorably with that seen in plants constructed only recently. Its owners are thus able to compete successfully with newer plants.

The main office of the company is located in a frame building near the plant which also houses the plant offices and weighing room. Officers of the company are: Julius Wise, president, and Charles Killen, general manager, secretary and treasurer.



Car hoist and elevator from primary crusher to screen.

Cement Wage Rates in Europe

(Continued from Page 38)

results: Working hours are 48 per week. The hourly rate varies from $0.093 to $0.112. And the price of Belgium cement is less than one-half dollar per 100 kilos, the cheapest in world markets.

Denmark

Annual production .....643,000 Metric Tons
Annual export .....335,000 Metric Tons
Annual import ..... 1,824 Metric Tons

The Danish government statistical department figures, as given in the Statistiske Efterretninger, states that wages of cement workers in the various plants differ greatly according to district. Copenhagen is omitted from the comparison. Otherwise there are about 1,500 workers employed in the industry and the rate of pay is high, as it is in the Danish porcelain industry and many others. In spite of this, cement, ceramics, and what-not seem to find foreign markets for a much bigger proportion of their output than might be supposed. In cement it runs to slightly over 50 per cent.

The hourly rate of pay averages $0.345. This represents a slight rise as from 1928. Labor hours are 48 per week.

France

Annual production .....5,100,000 Metric Tons
Annual export ..... 639,726 Metric Tons
Annual import ..... 155,000 Metric Tons

The League of Nations investigation of the wage problem shows that the wage of cement workers in France has shown a tendency to rise notably since 1928. In the Boulogne district, where important cement industries are localized, the hourly rates are given as follows:

	Plant No. 1	Plant No. 2
Burner	$0.078	$0.074
Grinders	0.093	0.07
Sack fillers	0.068	
Quarrymen	0.078	

The wage for quarrymen is arrived at by equalizing piece-work rate, i. e., per cubic metre of extraction.

In this district there is also a "high-cost-of-living" allowance of $0.08 per hour, plus an allowance for bread amounting to $1.40 a fortnight, plus various family allowances for wife and children of married workers.

Italy

Annual production .....2,558,000 Metric Tons
Annual export ..... 12,663 Metric Tons
Annual import ..... 10,044 Metric Tons

The hourly rate of pay is established as follows:

Northern Italy	$0.125
Central Italy	0.116
Southern Italy	0.092
Average	$0.119

Produce 124 Grades of Molding Sand by Close Control of Blending

All Employees Required to Serve One Year's Apprenticeship in Laboratory

By L. B. OSBORN

HOUGLAND & HARDY are producers of molding sand from deposits located in southern Indiana about twenty-five miles east of Evansville. From this point they produce 48 standard grades. These, with the special blends, make a total of 124 grades that are shipped, for every class of grey or malleable iron, brass and aluminum castings, weighing from a fraction of an ounce to several tons, and controlled to meet any foundry's specifications. In their production and controlling of these sands very modern and efficient methods in stripping, leveling, hauling, and milling are used.

Leveling land after molding sand has been removed.

A P&H Model 300A ½-cu. yd. shovel removes the overburden of the bonded sands which lay in deposits of uniform grain size in strata of different clay content, those of greater strength being found at the top. The crumbs of earth not removed by the large shovel are taken up by a Fresno scraper, and the pit-face is shaped up by hand. To uncover the natural silicates of molding sand a Holt Sixty Caterpillar tractor equipped with a LaPlant-Choate Manufacturing Co. bulldozer is used. This bulldozer is also used in all grading and leveling work. After being uncovered, both the bonds and the silicates of molding sand are removed almost entirely by hand and loaded into wagons pulled by Caterpillar Sixty tractors.

The present mill—the third that has operated in practically the same vicinity for this firm—is the outgrowth of much experimental work which started some years ago when C. M. Hardy, president and general manager of the company, was the first to conceive and put in effect the blending of molding sand for shipments to foundries.

The bonded sands and the silicates of molding sand are delivered to separate hoppers in the mill where they are proportioned for the blend desired by automatic feeders which are quickly adjustable to many different ratios of accurately measured proportions.

During the milling process the sands pass through three units, each having a different action on the sand. The first unit is primarily a disintegrator, but it also has a blending function. In the second stage, a thorough blending is given the sands by turning them rapidly together many times before discharging into the third unit where the operation is completed by cutting with blades equipped with manganese fingers revolving very

The first of two winter-storage bins, during erection, main plant at left.

View of deposit, showing how it is staked out for working.

Loaded wagons transporting materials to plant.

rapidly. The feeders and the milling units were designed by this company to meet its special demands. There is no other equipment like it, so far as the members of this firm are aware.

From the mill the sand is carried on a Link-Belt conveying system to a combined box-car loader and aerator which "fluffs" it while storing the material in the car for shipment. This loader and aerator is of special design by Stephens-Adamson Manufacturing Co.

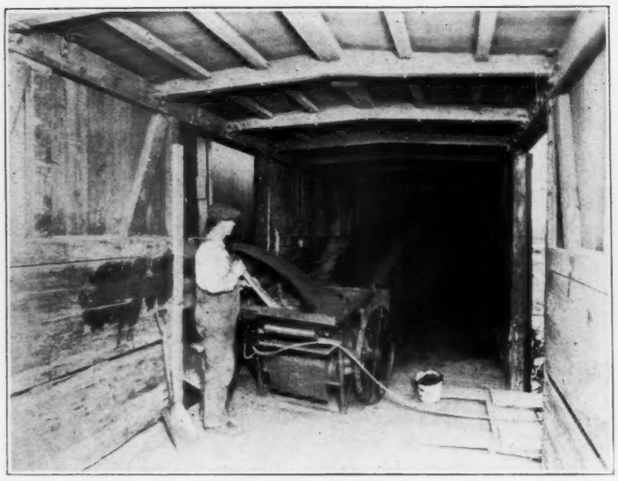
The time consumed from the moment the bonds and the silicates first enter the mill until the product is discharged in the box-car ready for the foundry's use is approximately five minutes; and, during that time, a most complete disintegration, blending, milling, cutting, and aeration has taken place. From an inspection of these various sands in the cars ready for shipment, it is impossible to discern that they were ever blended, so thoroughly has this been accomplished—the finished product having every appearance of a natural molding sand that has had but a thorough milling and aerating.

Storage bins, under construction, will hold several hundred cars of sand that will be stored during the summer when there is a low moisture content, for shipments in winter and in wet seasons, thus assuring all-year service to foundries. The raw materials will be hauled to storage in trucks, dumped into a hopper that discharges into a portable Link-Belt conveyor which will carry the sand to a Stephens-Adamson loader that will throw it into various bins.

The key to production is the controlling laboratory where all standard American Foundrymen's Association testing equipment is used. The deposits of bonded molding sand and the deposits of natural silicates of molding sand are daily sampled in the banks for a pre-determination of values. Records of tests are charted and the deposits

After stripping with this power shovel, the pit is trimmed by Fresnos and hand shovels.

C. M. Hardy, president.



Aerating the sand as it is loaded in car for shipment.

Corner of analytical laboratory.

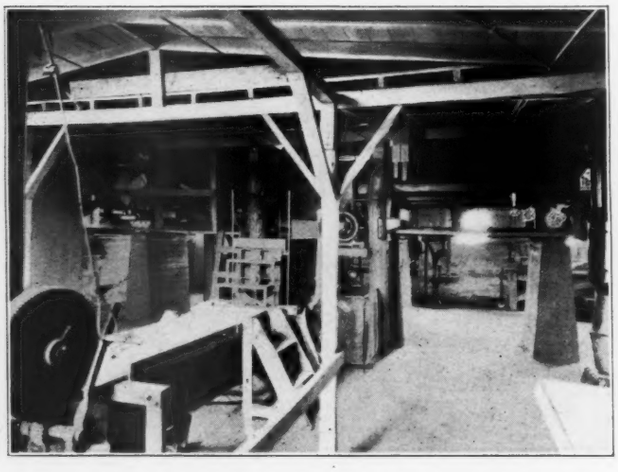
Closeup of materials face showing bands and spots where sampling was done.

staked off. These records indicate what combination of bonded sand and silicates of sand between certain stakes will produce the finished blend desired—as to bond, silica, clay permeability, green and dry-sand strength, and grain size. Recheck tests are made from samples secured at regular intervals as the sand drops from the conveyor belt into the aerator and loader. These tests and samples are filed away by numbers. Thru this system, future shipments can be quickly duplicated, or any change that a foundry might specify can be accurately adhered to.

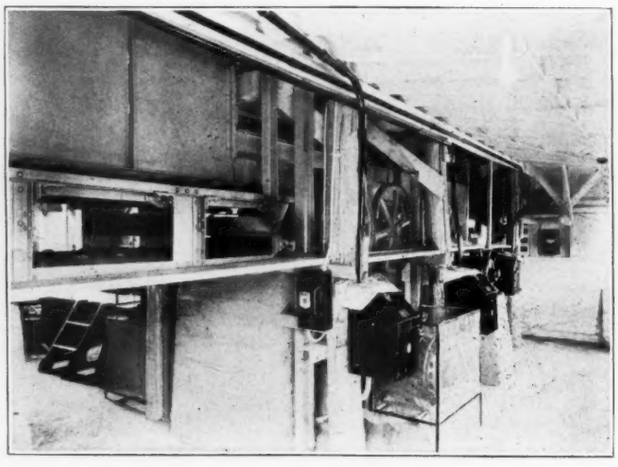
Experiments are being made continuously with the idea of further perfecting machinery that might add to the quality of the product. The laboratory department also is ever attempting to devise additional tests that will help foundries solve the always-present troubles caused from molding sands.

Much of the success of this company in the scientific production of molding sand is traceable to the fact that all employees are required to serve at least a year in their laboratory and experimental department before being entrusted with any molding sand production. This training applies also to salesmen who must be thoroughly familiar in detail with molding sand, as to its possibilities from a production standpoint, as well as schooled in foundry practice and the relation of molding sand to castings.

(*Continued on Page 69*)



The specially designed complete units for milling and blending sands.



Power side of the special mill, with hoppers and feeders for proportioning.

Sand and Gravel Plant in Michigan had Best Safety Record in 1929

By W. W. ADAMS
Supervising Statistician, U. S. Bureau of Mines

THE United States Bureau of Mines, in cooperation with the National Sand and Gravel Association, conducted a safety contest in 1929 among producers of sand and gravel. Only 26 plants were enrolled, as the contest was late getting under way. It is hoped that a much larger number of plants will be represented in the safety competition of 1930.

Among the larger plants the best safety record was that of the American Aggregates Corporation's Green Oak plant at Brighton, Mich. This plant worked 320,355 man-hours in 1929 and had 14 lost-time accidents which resulted in 92 days of disability. The plant's accident-severity rate was 0.287, representing the number of disability days per thousand man-hours of exposure to hazard. The best record among plants working less than 100,000 man-hours was that of the Urbana Sand and Gravel Co.'s plant at Urbana, Tex. The Urbana plant worked 62,261 man-hours in 1929 and had no lost-time accidents. Three other plants in this group also had no lost-time accidents during the year, but they did not equal the Urbana plant in the number of man-hours worked.

Honorable mention was awarded to the American Aggregates Corporation's plant No. 1 at Columbus, Ohio, and to the Yahola Sand and Gravel Co. plant at Keough, Okla., for establishing safety records which were second only to those of the winning plants in their respective groups of large plants and small plants. The plant at Columbus, Ohio, had an accident-severity rate of 1.353; the Keough plant had no lost-time accidents during the year.

Perhaps the most significant facts revealed by the contest records were the average accident rates for all of the plants combined. The contest as a whole covered 2,259,572 man-hours of exposure, and there were 168 lost-time accidents during the year. These accidents, weighed in accordance with standard practice, caused 21,947 days of disability. The accident-severity rate for the 26 plants was therefore 9.713 per thousand man-hours of exposure; the accident-frequency rate was 74.350 per million man-hours. The severity rate is usually considered the best index of the relative hazards of different industries or of different plants. One of the smaller plants had an unusually high accident-severity rate because, with only a small number of man-hours worked the plant had an employee killed by accident, which resulted in a charge of 6,000 lost-days against the plant's record. If the record of this plant were not included, the accident-severity rate for all plants in last year's safety contest would be 7.077 instead of 9.713.

Comparative figures for other branches of the mineral industry are not available for 1929, but the accident rates for sand and gravel plants for that year may be compared with similar rates for representative mines and quarries for 1928, as follows:

	Frequency rate	Severity rate
Anthracite mines	88.116	10.918
Bituminous coal mines	84.959	12.471
Metal mines	52.123	9.511
Nonmetal mines	52.689	7.935
Quarries and open-cut mines	29.327	5.208
Sand and gravel plants	74.350	9.713

Accident-frequency rates indicate the number of lost-time injuries, fatal and nonfatal, per million man-hours of exposure. Accident-severity rates indicate the number of calendar days of disability from accidents per thousand man-hours of exposure.

From the foregoing accident-frequency rates, it would seem that, for any given number of employees, accidents occur less frequently at sand and gravel plants than at coal mines, but more frequently than at metal and nonmetal mines and quarries and open-cut mines. The accident-severity rate for sand and gravel plants was also more favorable than that of either anthracite or bituminous coal mines, and, had it not been for the fatality at the small plant previously referred to, the rate would have been better than that of any other group except quarries and open-cut mines.

The number of man-hours on which the foregoing accident rates were calculated represents the equivalent of 9,519 men working 8 hours a day for 300 days at anthracite mines, 12,212 men working the same length of time at bituminous coal mines, 6,883 men at metal mines, 1,218 at nonmetal mines, 8,397 at quarries and open-cut mines, and 941 at sand and gravel plants.

Records covering only 26 plants do not lend themselves to much subdivision for studying the relative risks of different types of sand and gravel operations. However, for want of more voluminous records, the reports have been divided into three main groups, which include 12 sand and gravel banks, 11 pits (10 wet and 1 dry), and 3 river operations. Should enrollment be larger in future contests, it is probable that the following classification would be found desirable:

1. Bank.
2. Pit: (a) Dry; (b) Wet.
3. Marine: (a) River; (b) Lake; (c) Ocean.

Reprinted from U. S. Bureau of Mines Report of Investigations 3009.

In this classification a bank is defined as a sand and gravel operation where the deposit lies at a greater elevation than the working level of the plant; a pit is a plant where the deposit is lower or beneath the working level. A pit may be wet or dry; if wet, it may be by artificial or natural flooding. A marine plant is one where the deposit lies under a river, lake, or ocean.
resented in the safety contest are given below for the 26 plants which reported for 1929.

Comparative data for each type of operation reported was as follows:

COMPARISON OF ACCIDENT RATES FOR THE 26 PLANTS REPORTING IN 1929

Type of Plant	No. of Plants	Man-hours	Accident Rates Frequency	Severity
Marine (river)	3	121,403	65.896	0.791
Pit (wet)	10	1,122,207	68.815	.713
Pit (dry)	1	48,448	61.922	.949
Bank	12	967,514	86.686	21.710
Total	26	2,259,572	74.350	9.713

The accidents on which the above rates are based were classified as follows:

CLASSIFICATION OF ACCIDENTS

Type of Plant	Fatal	Permanent Disability Total	Partial	Temp.	Total
Marine (river)	...	...	...	8	8
Pit (wet)	...	...	...	77	77
Pit (dry)	...	...	...	3	3
Bank	3	...	2	75	80
Total	3	...	2	163	168

DAYS OF DISABILITY

Type of Plant	Fatal	Permanent Disability Total	Partial	Temp.	Total
Marine (river)	.....	....	....	96	96
Pit (wet)	.....	....	....	800	800
Pit (dry)	.....	....	....	46	46
Bank	18,000	....	1,500	1,505	21,005
Total	18,000	....	1,500	2,447	21,947

Omitting the figures for the dry pit because they represent the experience of only one plant, the foregoing figures show that river operations had fewer accidents in proportion to the number of man-hours worked than either pits or banks, and that the record for wet pits was more favorable than that for banks. From the standpoint of the severity of accidents, which represents the number of days lost in proportion to the number of man-hours worked, the best record was that of wet pits, with river operations occupying second place with a rate almost as favorable as that of the pits, and third place occupied by banking deposits. Three fatalities at sand and gravel banks gave that type of operation a high accident-severity rate, 21.710 days lost per thousand man-hours worked. If it had not been for these fatalities, the accident-severity rate for banks would have been 0.311 and more favorable than that of any other group.

When all the plants were grouped into two classes, those working less than 100,000 man-hours and those working 100,000 or more man-hours, the figures showed fewer accidents at the smaller plants for any given number of man-hours of exposure. This is contrary to the usual condition at metal mines and quarries and it may be that reports covering a larger number of sand and gravel operations would tell a different story. The accident-frequency rate was 48.837 per million man-hours for the smaller plants as compared with 95.487 for the larger plants, the former rate being based on 1,023,804 hours and the latter being based on 1,235,768 man-hours. No comparison is drawn between the accident-severity rates for the two groups because the rate for the smaller plants was raised abnormally by the occurrence of three fatal accidents with a charge of 6,000 lost days for each fatality.

An examination of the figures shows that the average period of disability following each temporary injury was 15 days. This represents the "healing period" or the average length of time required for the injured employee to recover sufficiently to return to work. The average healing period for temporary injuries varied with the type of plant, being 12 days for river operations, 10.4 days for the dry pit, 15.3 days for wet pits, and 20 days for banks.

In calculating the accident-severity rates of the various plants, temporary injuries were charged with the actual number of days during which the injured employee was disabled, except that the day on which the accident occurred was not counted. Deaths and permanent injuries were charged with the number of lost days shown in the scale adopted by the Association of Industrial Accident Boards and Commissions.

Reports covering the three fatalities which occurred during the contest period showed that one man was killed while he was leaning against the frame of a crane; the crane swung around and caught the man between frame and cab. An employee at a gravel-washing plant fell against the belt conveyor; his neck was broken and his trunk crushed and he died from his injuries. The third fatality occurred when an employee, while cleaning a gravel bin, was covered by gravel and suffocated. Nonfatal injuries were due chiefly to handling objects, falls of persons, haulage equipment, falling objects, hand tools, and machinery. Individual accident reports covering 146 accidents revealed the fact that these six classes of accidents accounted for 78 per cent of the total number of accidents from all causes.

In view of the fact that very little definite information is available regarding accidents at sand and gravel plants, a complete list is attached to this report covering all accidents for which individual reports were received. The list is arranged to show whether the property was a bank, pit, or river operation, as far as it was possible to determine this fact from records available to the Bureau.

Companies desiring to participate in the 1930 safety competition are cordially invited to do so. Enrollment applications will be mailed upon request addressed to the Bureau of Mines. All producers of sand and gravel are eligible for enrollment.

Keeping Tab on Office Expenses Often Key to Increased Profits

Classification and Comparison of Cost and Expense Items May Eliminate Losses

By J. J. BERLINER

NET PROFIT—the margin between sales and cost—is increased directly by cutting costs of operation. But before costs can be cut, leaks must be located, either by personal observation of the working methods, or by an analysis of the expenses. The latter is by far the surer and most scientific method. Frequently it is not applied to office expenses, however.

For the necessary data, considered merely as a part of an overhead charge, is either so general in nature, or so hidden in a mass of entries as to be practically unavailable, and therefore valueless. A comparative statement of office expenses, properly analyzed and maintained, month by month, will indicate conditions demanding executive attention.

Office expenses may be classified naturally and logically into six general groups:

1. Maintenance of office.
2. Office rent and repairs.
3. Salaries and expenses.
4. Stationery and supplies.
5. Depreciation, furniture and fixtures.
6. Communication service.

To secure adequate data for comparative purposes, these general classifications should be further analyzed into their constituent elements. The individual expense accounts belonging to each group should be grouped together in the same section of the general ledger.

Whether a further classification is to be made by departments depends. Where a large office force is employed, it is advisable to carry a separate account with each department, subdividing the subheads of the six main groups.

Where the expense is of a general nature and cannot be directly assigned, the amount should be apportioned on an agreed percentage, and charged to the departments through the journal at the end of the month. In cases where it is not desirable on account of the size of the office to divide the expenses by departments, expense accounts should be maintained only with the subdivisions—Envelopes, Letterheads, Stamps, and so on.

When the building or space occupied is leased, the rent is easily determined. When it is owned, a fair rental based on the capital invested should

COMPARISON OF OFFICE EXPENSES

Month of 19

CLASSIFICATION	SALES DEPARTMENT			PURCHASING DEPT.			ACCOUNTING DEPT.			CORRESPONDENCE DEPARTMENT			TOTALS		
	This Month	Last Month	Year Ago	This Month	Last Month	Year Ago	This Month	Last Month	Year Ago	This Month	Last Month	Year Ago	This Month	Last Month	Year Ago
Rent and Repairs															
Rent															
Repairs															
Heat															
TOTAL															
Communication															
Telegraph															
Telephone															
Service															
Operator															
Tolls															
Messengers															
Carfare															
TOTAL															
Stationery Supplies															
Letter Head															
Ink															
TOTALS															

The "profitable parallel" applied to the analysis of office expenditure. By comparing current outlay with that of previous months, the proper balance can be maintained.

be charged. If a part of the building be used for other than office purposes, the proper charge is determined on the basis of the relative floor space used. To distribute the expense by departments the same rule may be used, the rental for space used by two or more departments being divided on an agreed ratio.

The repairs made from time to time can most easily be included under the general "Rental" group. But a separate account should be kept with "Repairs of Building," whether it be owned or leased. The information should be of the highest value, when the time came to consider moving, rebuilding or opening negotiations for the renewals of a lease.

In and near large cities, the rental charge often includes a charge for heat. But where heat is not furnished by the lessor, or where the building is owned, the cost of heat should also be included in this group. For the purpose of apportionment between departments, the simplest and most logical basis is to divide the costs on the basis on which the rental charge is assigned. This holds true for both "Repair" and "Heat."

"Maintenance of Office" is distinct from "Repairs," in that the latter arise from unusual or emergency causes, while the maintenance charges are generally matters of daily routine. The best method of handling is to keep an account with each principal element, and to group the minor items into a general maintenance account. The latter should not, however, be turned into a general dumping ground, and every entry should be fully explained, that an analysis of the account may be made without checking each item back to the book of original entry.

The principal accounts classified under "Maintenance" are "Light," "Janitor Service," "Drinking Water and Ice," "Soap and Towels," and so on. These charges may be logically divided by departments on a pro rata basis.

Salaries and expenses form a group readily assigned to the individual departments, except in the case of the general executives, or of the office boys and stenographers who do work for all departments. In amount the salary accounts are by far the greater, and the items chargeable to "Expense" include only such matters as subscriptions to technical books and items of like nature, immediately personal to an officer or employee, but borne by the concern. In general, separate accounts may be kept by departments both for salaries and expenses, or a subdivision may be made by functions, chief clerks, bookkeepers, clerks, stenographers, messengers and the like.

The best accounting practice considers the office supply accounts of a going concern as inventory accounts to which all purchases are charged. As each account is credited with the supplies used, the corresponding debit being to the individual office "Supply Expense" accounts, at the end of any fiscal period, the balance of each account is an asset, representing the cost of supplies on hand, unused, and so appear on the balance sheet. While the simplest procedure would be, of course, to charge the individual office expense accounts immediately with the cost of supplies bought for that department, the result would hide the real situation. The purchase of the supply of forms to last a year would be charged against the operations of a single month.

Where a stockroom is maintained, under the care of a stationery clerk, the keeping of a perpetual inventory is possible by the maintenance of a separate stock account with each lot of supplies or stationery should go to the clerk in charge of the stock ledger the moment the goods are received. He should enter the following information on the debit side of the proper ledger account: the date, the name of the seller, the quantity, the price of each unit, and, in the amount column, the cost. As the supplies are needed in the office, requisitions should be drawn on the storekeeper, who should be instructed never to deliver any supplies except upon the properly signed requisition. Each day the requisitions should be turned over to the bookkeeper, the proper expense accounts debited and the corresponding asset accounts credited.

In order to keep the asset account, "Office Equipment," down to its proper value, as well as to determine the amount of the office expense, the account should be credited with depreciation, the corresponding debit being to "Office Equipment, Depreciation." The simplest method is to charge off periodically a certain fixed percentage of the original cost, the rate being based on the probable life of the equipment. Whether the credit be made to the asset account or be set up as a "Reserve for Depreciation," does not matter materially.

Telegrams, telephones, and messenger service form the group called "Communication Service." The telegraph service can be accurately distributed to departments by tracing the sources of the messengers sent. The same is true of the toll calls. Undoubtedly it would be wise to use separate accounts for the regular telephone rental, for the tolls, and a third account for the salary of the telephone operator. Messenger service forms the third large element in this group and where messengers work both inside and out of the office, apportionment must be made on an arbitrary basis. The carfare furnished messengers should also be charged to a separate account in the same group.

The accounting for expenses may either be carried through the general ledger, or in the case of large offices through a sub-ledger a controlling account being carried on the general ledger. The division of the accounts secures data for a comprehensive comparative statement of the costs of operating the office. Each manager must devise a comparative statement suited to his needs. Accurately compiled and carefully analyzed, this statement will point out the office extravagances which eat into profit.

Lubricating Plant and Quarry Machines Subject to Exposure of Water*

THE EXTENT to which it may be necessary to maintain lubrication in the presence of water is becoming more and more evident as machinery such as the air tool, for example, is adapted to new usages. As a result, there has been extensive research on the part of the petroleum industry in an effort to develop lubricants of moisture-resisting characteristics, or lubricants which will emulsify to a sufficient extent to develop and maintain a positive lubricating film between the wearing surfaces involved.

Drag-line scrapers have many operating parts exposed to the weather and these need special lubricating care.

Perhaps the earliest effort to counteract the washing effect of water was the development of compounded steam cylinder oils for the lubrication of steam cylinders where wet steam was employed. It is a fact known to every power plant operator that wherever moisture may be involved in steam, the washing action of the former will tend to rapidly impair any film of lubricant which may be present upon the cylinder walls, valves and valve seats. It was proved, however, that by adding in the neighborhood of six to ten per cent of animal oil, such as tallow or degras, that sufficient adhesiveness would be brought about to create a decidedly tenacious and moisture resisting lubricating film.

This idea has since been studied in the development of the highest grade of distillate lubricating oils for marine Diesel engine air compressor service, where condensation during standby may oftentimes lead to rusting and corrosion of the cylinder surfaces. Lard oil, in this case, has been used as the compounding and emulsifying medium in the lubricating oil.

The hydraulic accumulator, the deep well pump and the multitude of materials handling equipment operating out of doors, have all developed other phases of operation wherein it is absolutely essential to counteract the effects of water upon the lubricants used, as well as the wearing surfaces. As a result, it will be of distinct interest to discuss certain of the outstanding features of industrial machinery operation and the salient characteristics of the lubricants which should be used.

Characteristics of Lubricants

In the selection of a lubricant for underwater service, it is important to remember that the characteristics be such as to insure positive adhesiveness and ample resistance to the washing-off effects of water. As a general rule, these characteristics are developed by the use of suitable animal oils or soaps which will tend to emulsify in the presence of water.

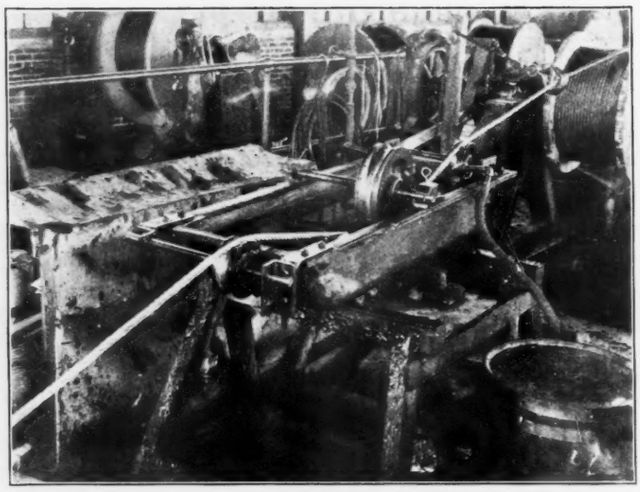
In a grease, it is the soap content which must be studied. This latter must be non-soluble; in other words, it must be of a lime or calcium base. Were a soda soap used, due to the fact that this is normally soluble in water, upon contact with this latter, the soap would be dissolved from the oil, rendering this incapable of maintaining effective lubrication, especially if there is any possibility of it being washed out from between the bearing elements.

It is also important to remember that wherever water conditions may prevail there will be the possibility of comparatively low temperatures developing, especially on materials handling equipment in the coal mine or where pneumatic tools are involved. As a result, the oil content of any grease to be used for such service should have as low a pour test as possible.

The fact that the pour test is one of the most important characteristics of any oil which is to be used for the lubrication of machinery in cold weather, renders a brief description advisable, due to the confusion that may frequently arise in this regard, and the methods of test which are employed.

Take the so-called "cold test," for example. This has been regarded variously as that temperature at which an oil loses its fluidity, or the temperature at which solid matter commences to separate. The fact that this latter pertains directly to paraffin base oils renders this term more or less irrelevant in respect to naphthenic or mixed base lubricants. Yet, it is these latter which are most directly applicable to cold weather lubrication.

*Reprinted from *Lubrication* (The Texas Company).



Approved method of lubricating wire rope.

(Left)—Underside view of tractor showing exposed gears which come in direct contact with water.

In the case of paraffin base oils, the "cloud test" as generally known today, is that temperature at which solid paraffin wax commences to crystallize out or separate from solution when the oil is chilled under the conditions specified for this method of test.

Were this test to be applied to a naphthenic base oil we would be dealing with that temperature just above which fluidity practically ceases. This temperature has with equal vagueness been variously termed the "melting point," "setting point" and "point of congealment."

Today, however, it is more generally known as the "pour test" where any other than paraffin base oils are being dealt with.

There has also been marked confusion in regard to methods of determining this temperature, and ignorance in regard to the factors which may have influence upon accurate determination. Especially is this true in regard to the preparation of the sample for test.

The effect of cold upon lubricating oils is not the same as upon simple fluids such as water, alcohol, glycerine, benzine, etc. The latter have fixed and accurately ascertainable freezing points at which a complete change from the liquid to the solid state takes place, but lubricating oils which are mixtures of hydrocarbons of various melting points or freezing points behave like solutions, and frequently deposit some portion of their constituents before the whole mixture solidifies.

Interesting phenomena which can only be explained by changes in the inner or molecular structures are observed in the pour test of many lubricating oils. If, for example, we take the pour test of an oil without previous heating and then take the pour test of the same oil after heating to 120 degrees Fahr., after allowing it to cool to the same temperature as the first, the oil which is heated solidifies at a considerably higher temperature and the influence from preheating seems to be effective for a considerable time, at least for twenty-four hours. Heating to temperatures below 90 degrees Fahr. apparently has no influence.

Another factor which has an effect on the test is stirring the oil while cooling to determine the pour test. In case an oil is stirred it solidifies at a lower temperature than when held stationary. This may be explained on the assumption that the movement of the oil destroys the formation of a fine network of microscopic particles of paraffin or naphthenic bodies which are separating out.

This segregation gives the oil a certain support and thereby facilitates solidification. In an analogous way this explanation may apply to the influence of preheating; the waxy or asphaltic particles are probably transformed by warming, into a very strongly dispersed state from which it is possible to form a finer and thicker network than in the oil which has not been heated.

Numerous tests have been devised to determine the pour test of lubricating oils, each of which gives various and sundry results in the hands of different operators, due not only to ambiguity and lack of conciseness of the description of apparatus and method, but also in the application of the methods to oils for which they are adaptable.

Committee D-2 of the American Society for Testing Materials has taken considerable pains to work out a standard method for this determination. This method, while not new in principle, is more complete in detail than any previously published. It includes a precise definition of "cloud test" and "pour test" and classifies the oils to which each or both are applicable. Attention is therefore called to the report of this committee in event of the desire to study this matter of pour test in greater detail.

Where there is provision for oil lubrication on machinery subjected to water conditions, the oil must be studied from the viewpoint of its adhesive characteristics, as already stated, as well as its pour test. In oils for such service, the emulsifying constituent is normally an animal oil, although in marine service it is customary to use rapeseed oil to develop this same characteristic in marine engine oils.

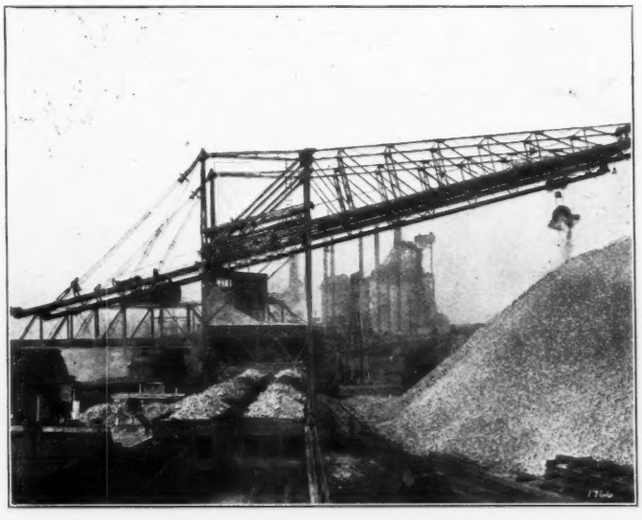
Animal and vegetable oils are commonly called fixed oils. They are adhesive to metal, incapable of distillation, and have the ability of uniting with water to form a tenacious lubricating film. In general, this latter will be comparatively permanent, whereas an emulsion which may be developed by a mineral oil alone, when agitated with water, will be more or less temporary, depending upon the degree of refinement of the oil. It is inadvisable, however, to depend upon the emulsifying characteristics of a mineral oil alone, hence, the custom of adding a few percent of fixed oil to render emulsification more positive.

The amount of such compound will, of course, depend upon the service involved. Where an oil is to be used for Diesel engine air-compressor lubrication, approximately 3 per cent of lard oil will suffice. For steam cylinder service, in turn, the per cent of compound may range from 4 to 12 per cent, or even higher. As a general rule, tallow or degras (wool oil) is used in such products. In brief, the amount and nature of the compound and the original viscosity of the mineral oil will depend upon the service to be ultimately performed.

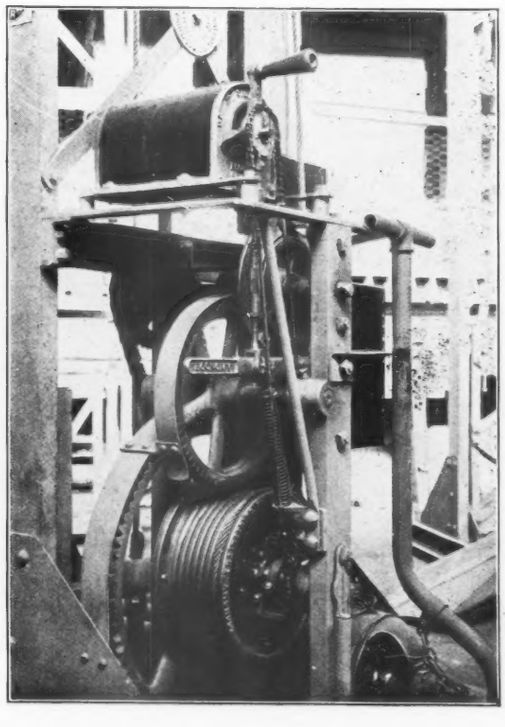
In regard to this latter, it is interesting to bring out that the viscosity must also be considered. Viscosity, however, will be a function of the operating temperature. In marine engine service, for example, where reciprocating engine bearings operate at comparatively normal temperatures, a viscosity of approximately 600 to 700 seconds Saybolt at 100 degrees Fahr. will suffice. Steam cylinder oils, on the other hand, will require a considerably higher viscosity ranging, as a rule, from 100 to 180 seconds Saybolt at 210 degrees Fahr. It is also interesting to note that a gear compound for use under water conditions should range in the neighborhood of 1000 to 2000 seconds Saybolt at 210 degrees Fahr. Here, however, it is a matter of the pressure which must be counteracted rather than temperature, although in steel mill service hot water will frequently be encountered. The pour test requirements for an oil for use under water conditions will be practically the same as a grease for such service. Attention, therefore, is drawn to the previous remarks dealing with this test.

Water conditions in the operation of pneumatic tools will frequently impose a decided load upon the lubricants involved. In the case of rock drills and other pneumatic mining machinery, operating oftentimes at a considerable distance below ground, water may become a serious factor, even if the tools are designed for operating on dry air, for condensation may develop to a marked extent especially when the tools are not operating. Furthermore, there is a possibility that a considerable amount of water may surround the exterior part of the tools and air piping due to mine leakage.

It is also important to remember that frequently water is intentionally mixed with the air to be used in such tools to serve the purpose of washing cuttings from the drill hole, in much the same manner as a soluble oil solution washes metal cut-



Correct lubrication is vital on the exposed wearing parts of unloading equipment.



(Right)—The exposed rope and gears on electric hoists require careful selection of lubricants.

tings away from the tool in the machine shop drill, etc.

It is for this reason that compounded lubricants, i.e., mineral oils containing more or less animal oil or soap in compound, are recommended for such equipment as hammer drills where operating more or less in the presence of water. Such lubricants, of course, function on the same principle as do steam cylinder oils. In other words, they emulsify with water by virtue of their fatty content, creating an adhesive emulsion which adequately resists the washing effects of water and sticks tenaciously to all wearing elements.

Such lubricants, however, are only recommended for air tools wherein water is intentionally mixed with the air or where it is more or less positively known that a certain amount of water may gain entry into the tool mechanisms during operation.

When pneumatic tools are designed to function dry, they should be absolutely dry, that is, free from moisture as far as possible, for the usual lubrication recommendations for such equipment will specify straight mineral products. These, if properly refined and of the requisite viscosity, and pour test, will adequately withstand any slight washing effect that may develop due to condensation of moisture from the compressed air as normally used. They will not, however, protect the wearing surfaces against any excessive wear as may occur if the tool is dropped in the mud or allowed to remain exposed to the elements for any length of time when not in use.

The ultimate result will, of course, be rusting and corrosion, with subsequent difficulty in operation, an inability on the part of the tool to perform its rated amount of work and a necessity for repair or replacement of parts.

In the wet type of tool, such as the hammer drill, water leakage must also be guarded against, for the operation of the tool may be thereby impaired. As a result, conditions in the cylinders of such tools are somewhat similar to those encountered in the cylinders of water pumps. It is important to remember in the case of mine tools, that this water may also frequently contain an appreciable percentage of acid which would increase the possibility of subsequent corrosion.

Pumping Machinery

The lubrication of deep well rotating shaft type pumping machinery is a problem in the irrigation and water works field, where water must be raised from a considerable depth. For this purpose vertical centrifugal pumps are often used.

Water is usually brought to the surface through a pipe within which the pump shaft is located. This shaft carries one or more impellers, according to the depth involved, the amount of water to be pumped, and the size of the well casing. It is the function of these impellers to raise the water at the requisite rate of discharge. Rotation is usually brought about by means of electric motor power. Due to the speeds of operation, which may range from perhaps 700 to 1800 r.p.m., direct drive is possible, although belt connections are perfectly feasible and frequently more practicable.

One of the essential lubricating problems on such pumps is to take care of the steady bearings in the cover pipe. These serve to center and hold the shaft in proper alignment, prevent deflection and maintain the requisite pressures with as vibrationless operation as possible. But only can these ideals be attained through the medium of effective lubrication. Essentially, the lubricant should be so constituted that it will

(1) Maintain the requisite lubricating film;
(2) Have as little tendency as possible to run out at the bottom of the pump from between the shaft and casing or cover pipe; and
(3) Show as little internal friction as possible, for otherwise this would act as a brake on the impeller shaft.

Water can, of course, be used as a lubricant on such pumps, especially where a cover pipe is not employed. It is effective, economical, and prevents the possibility of contamination of the water being pumped.

Under certain conditions of sand, or the presence of other such fine particles of foreign matter in suspension, it is, however, generally considered better practice to provide for oil lubrication, installing a suitable cover pipe and bearings of design capable of bringing this about. Where water is the lubricant, these latter are oftentimes of rubber or hard wood.

Whatever the type of lubricant, however, the design and location of the bearings is a most important feature. Usually they must be located relatively close together. On certain pumps this distance is approximately eight feet.

Where lubrication by means of fluid oil is practicable, due to the high speeds involved, it will usually be best to use a comparatively low viscosity product. In general, a viscosity of from 180 to 200 seconds Saybolt at 100 degrees Fahr. will serve the purpose, providing that the stuffing box in the bottom of the cover pipe gives the requisite seal.

Under conditions of a marked difference in head, however (especially where automatic circulation of the oil is not provided for) the oil might exert a pressure on the openings around the bottom bearings so much greater than would the water in the well (particularly when the pump is not operating) that this oil would run out at the bottom between the shaft and cover pipe, if the stuffing box happened to be worn to any extent.

This occurrence will be indicated by an excessive consumption of oil. The procedure in such a case would be to resort to a grade of liquid grease which will not only be capable of giving adequate lubrication with as low a drag as possible, but also will have sufficient body to resist the unbalanced pressure which may be involved.

As wear on the stuffing box increases, it may in

turn be necessary to use a heavier grade of grease, though, of course, this may involve the sacrifice of a certain amount of mechanical efficiency. Such a grease should have a consistency very nearly the same as that of vaseline, and should be a product which will retain its plasticity at the approximate temperature of pumping.

The adaptation of automatic balanced circulation lubrication, whereby oil is fed from a surface tank so located that oil and water pressures will be equalized is claimed to eliminate the possibility of waste and contamination of the well water. This oil is pumped through the bearings and back via a return pipe, by a suitable lubricant pump.

Such a system makes possible the continued usage of a fluid lubricant capable of giving the desired results with the least development of internal friction. Of course it requires the use of a suitable cover pipe, within which the shaft and steady bearings are located.

Filling air-line lubricator with oil in an underground drilling operation.

Here, the problem is much the same as involved with a turbine, excepting that the temperatures are lower. Therefore, oils of approximately the same viscosity as mentioned above should function satisfactorily.

Another type of pump, the operation of which may often involve lubricating problems, is the mine pump so necessary in the anthracite coal fields, etc. Here water conditions may be very bad; therefore, it is necessary to employ the most rugged type of heavy duty pump to keep the sumps and galleries clear. For this purpose, naturally, many makes of pumps are used. In general, however, they will involve either the horizontal reciprocating steam or air-driven pump, the vertical motor-driven triplex pump or the centrifugal pump.

Where bearings alone are involved as in the motor-driven centrifugal pump, lubrication will be a relatively simple matter. Ring oilers predominate and these can usually be taken care of by means of a medium body straight mineral engine oil of from 200 to 400 seconds Saybolt viscosity at 100 degrees Fahr. This same oil can also be used with satisfaction on the external bearings of reciprocating pumps.

In lieu of oil, however, certain builders will prefer grease due to the fact that frequently there will be less chance for dust or dirt gaining entry to score or abrade the bearings. With either the compression or spring type of grease cup, a medium bodied cup grease will serve the desired purpose. It is furthermore of advantage wherever shaft ends are exposed, for a seal of grease will prevent the entry of dirt more readily than an oil film due to its higher consistency, and the degree to which it "stays put" in the bearing.

Where mine pumps are of the outside packed plunger type they require a lubricant which will keep the packing properly sealed and prevent excessive wear on the plungers.

A relatively high viscosity straight mineral lubricant will usually serve this purpose. Not only will such a product lubricate the plunger, but also it will seal the clearance space effectively and lubricate the packing so that there will be little or no danger of this being damaged. Another advantage of such a lubricant is that it will adequately protect the plunger from the corrosive effects of sulfurous compounds with which the mine water may be contaminated.

Material Handling Equipment

Wire rope lubrication is one of the most important factors in any plant where materials in bulk, such as ore, coke or coal, are to be handled; for the ultimate efficiency of operation is, to a large extent, dependent upon the condition of the cables or wire ropes.

It can be easily realized that a rope with one or two broken strands due to rusting or wear traceable to improper lubrication, may not only cause a tie-up of the entire machine if such strands interfere with the operation of sheaves, or other companion cables, but may also present a distinct hazard. Any wire rope in such condition is just that much weaker and less capable of handling the existing loads.

It is not enough to assume that because such ropes come from the manufacturers in a lubricated state, being in general wound on an oil-saturated core, that further lubrication is unnecessary. Under operation there is constant friction and wear between the strands and a tendency to squeeze out any contained lubricant, especially when the ropes pass over sheaves or around drums. The renewal of this product is, therefore, an absolute necesity.

The matter of friction between the strands of a wire rope is essentially the same as friction between a bearing and a shaft. Overheating and abnormal wear will practically always result, to reduce the load carrying capacity and increase the amount of power consumed in operation. This can only be overcome by effective lubrication, brought about by the proper application of a suitably prepared wire rope compound, which will be capable of not only penetrating to the innermost strands and core of the rope, but also sufficiently adhesive and viscous to resist being prematurely squeezed out or washed off by rain or sleet.

Essentially a wire rope lubricant, in addition to the properties mentioned above, must not tend to cake, gum or ball up, especially if contaminated with an excess of dust, dirt or metallic particles.

Furthermore, it must be resistant to the thinning-down effects of higher temperature. This, of course, directly involves the viscosity or relative fluidity of the product. In fact, viscosity of such products is the essential characteristic involved in purchasing. It should not, however, be assumed as being the chief guide as to the actual suitability of a wire rope lubricant.

In this regard the ability of the latter to function, penetrate and stick under actual operating conditions, is of outstanding importance. In consequence, such products should not be purchased haphazardly, nor on a price basis alone. The potential difficulties that might result in cold weather are too serious.

Note how the gears and bearings are exposed on this grinding mill.

Wire rope lubricants to meet the aforesaid requirements should, in general, be straight mineral petroleum products, devoid of fillers or thickening mediums. In other words, whatever the viscosity, it should be an inherent property of the lubricant, not an artificial characteristic which cannot be depended upon.

It is for this reason that greases or soap thickened mineral oils are relatively unsuited to wire rope lubrication. To attain the requisite body a comparatively high percentage of soap would be necessary. Soap, of course, serves as the carrying medium for the oil. It has relatively no lubricating value, however; as a result, this property in the resultant product is decreased to a marked extent. Furthermore, the adhesive characteristic of greases is low. In consequence, such products will not, in general, meet the requirements of wire rope lubrication.

As a general rule wire rope lubricants, by virtue of their viscosity and inertness, must be applied in heated condition. To merely attempt to daub or paint a rope with such a product at normal temperatures would be relatively ineffectual. Even though the surface might be more or less coated, the possibility of penetration occurring to any extent would be remote. This latter is the secret of effective wire rope lubrication. The amount of wear occurring between the exterior of such a rope and the sheaves is not as marked as that which occurs between adjacent strands when the rope is flexed or bent as in passing over sheaves or hoisting drums. On the other hand, bending promotes penetration of the lubricant.

A very satisfactory method of treating wire ropes is to use a form of split box through which the rope can be run. Such a box can be readily built in the average plant, with suitable provision for rendering it sufficiently tight to prevent the lubricant from leaking out, even when reduced in viscosity by heating. The slow passage of the rope through such a bath of heated compound will insure that not only will the surface be coated, but also that the requisite penetration takes place on the inner strands. Further slow working of the rope over the sheaves before the lubricant has time to cool completely will tend to aid in bringing about the maximum of penetration.

Hydraulic Equipment

The hydraulic elevator and the hydraulic accumulator are examples of the use of water power for the conservation and transformation of energy. The earlier types of elevators employed in building construction were frequently of the hydraulic type. Even today the same principles are employed in the construction of certain types of sidewalk hoists.

The hydraulic accumulator, as it is termed in the steel industry, serves more or less the same purpose as a flywheel, in that it is used to accumulate energy for subsequent usage in operating the doors of the soaking pits or for certain types of shears, for example.

The mechanism of the accumulator involves a suitable storage tank capable of retaining water under the pressure involved. By means of control valves, the power contained therein can be made to act upon a heavily weighted plunger, via its retaining cylinder. The principles of operation are much the same as those of the hydraulic elevator.

While the term "hydraulic" implies the use of water, it has been developed that light oils can be employed with excellent results as, for example, in the case of the marine telemotor and in the operation of certain types of hydraulic presses. For the purpose of this article, however, we are more specifically interested in those cases where water is used.

The extent to which lubrication is involved is confined to the plungers and piston rods. The purpose is to maintain the leather cups of the control valves in a soft, pliable condition and preventing too rapid deterioration of the packing. In a closed system this may be accomplished by adding an emulsifying compound to the water. By use of a compound, such as soluble oil, precipitation of any fine grit or impurities which may be held in suspension is also brought about, to thus prevent possibility of excessive wear on the moving parts with which water must come in contact.

An effective method of lubricating plungers, especially in the steel industry, to prevent scoring, preserve the packing and reduce water leakage, involves the use of sight feed oil cups. A satisfac-

factory lubricant can be developed by mixing a light gear compound with steam cylinder oil.

Steam Cylinder Lubrication

From the viewpoint of the actual composition of a cylinder oil, the question of moisture in the steam is the most important factor involved.

Steam will always contain a certain percentage of moisture unless it is superheated to a sufficient extent to counteract any line and cylinder condensation which may be caused by the cooling effects of the piping or cylinder walls, and the expenditure of heat by the expansion stroke.

The presence of moisture in steam will usually result in a film of straight mineral lubricating oil being rapidly washed off from the cylinder walls and other surfaces with which the steam comes in contact. Therefore, to secure proper lubrication under wet steam conditions it is necessary to either increase the rate of flow of a straight mineral oil or else substitute an oil which contains a certain percentage of fatty compound, such as degras or tallow.

The practice of using a straight mineral oil to lubricate wet steam is customary only where the presence of a fatty oil in the exhaust steam is objectionable. The increased amount necessary to insure proper lubrication will often result in imperfect atomization. As a consequence, oil accumulations in the cylinder will be prevalent and carbon deposits developed.

Especially will the above be true in multiple expansion engines equipped with receivers and reheaters, the high temperatures to which the oil is subject being very conducive to carbonization. In poppet valve engines carbon formation of this nature may often cause imperfect operation of the valves.

Where a compounded oil is used adhesiveness is developed toward the metal, repelling the moisture in the steam from the cylinder wall. The lubricating film thus has a greater affinity for the cylinder walls and other wearing surfaces and becomes highly resistant to the washing action of the water in the steam. Naturally the greater the percentage of moisture in the steam the higher should be the fatty compound content of the lubricant.

In general the compound should not exceed 10 per cent, however, except in extreme cases of abnormally wet steam. We must remember that an excessive amount of fatty compound, beyond that necessary to form the requisite emulsion, will not improve the lubricating value of the oil. In fact, it may even be an objection, especially under continued exposure to high temperatures on account of the tendency that animal fats have of decomposing under such conditions.

In regard to the proper amount of compound to use in an oil it can be said that this should be just sufficient to maintain a film of oil on the cylinder walls. This is especially true where the exhaust steam is to be used for feed water heating or in process work of any nature. Under such conditions it is more important than ever to observe caution in selecting and using steam cylinder lubricants.

Present day practice is to more and more reduce the quantity of compound and to improve its quality.

That tendency in compounded oils which causes them to unite with water to develop adhesiveness on the walls also prevents ready separation from water in condensed steam; furthermore, the more completely atomized the oil the more difficulty wili it have in separating from water.

Oil in the form of fine emulsions in a boiler combines with the boiler compounds to cause foaming, or with the boiler impurities to produce a coating over the tubes and fire surfaces. This coating seems to form more readily over relatively clean tubes than over dirty ones.

A very thin layer of oily sludge over a tube surface will so insulate it that there is not only a large loss in heat efficiency, but the rise in temperature of the metal may be so excessive as to cause burning out or explosion of the boiler.

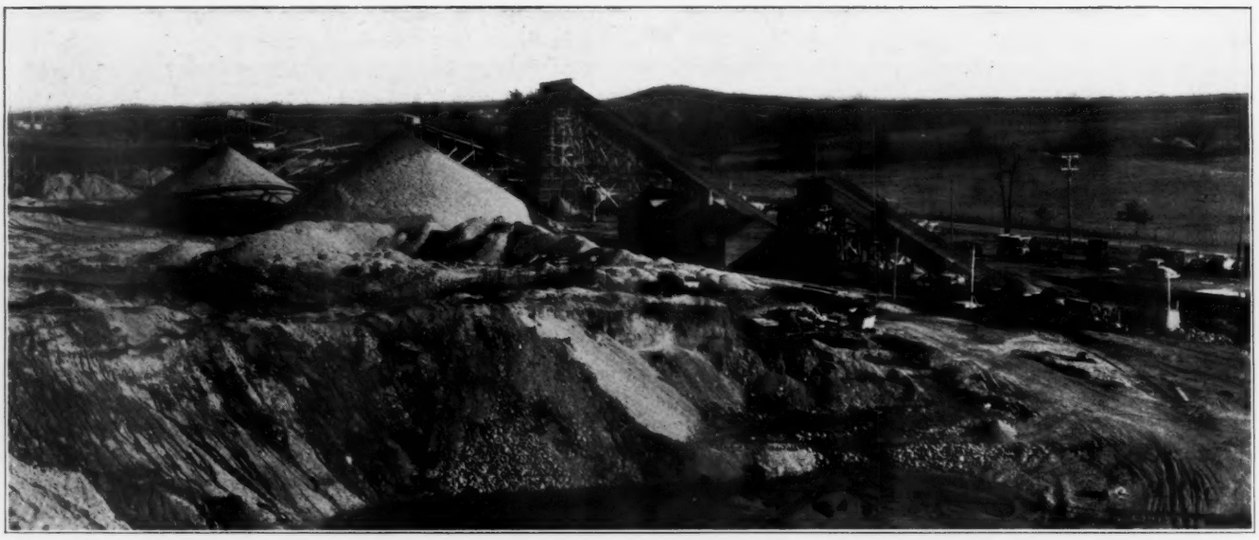
Texas Plant Chief Urges First-Aid Team Contests Be Held

In speaking optimistically regarding the greater reduction of accidents in cement plants, H. E. Nichols, superintendent of Southwestern Portland Cement Co., El Paso, Tex., said recently: "We at El Paso are doing what we think is our best to eliminate all accidents in this plant, but evidently it is not enough. The Bureau of Mines First-Aid Car No. 2 has been in El Paso for two months, the men in charge training men in every industry in this vicinity, including policemen, boy scouts and some Mexicans across the river in Juarez. One hundred and twenty of our 210 men have completed this training." And he added, public contests, such as were held in El Paso on April 12, "will no doubt stimulate safety first not only on the job, but in the home, on the street and on the highways. We have three safety first committees who meet regularly once or twice every month, and the foremen call their men together for a five-minute safety talk before every shift."

Produce 124 Grades of Sand

(Continued from Page 58)

Offices of Hougland & Hardy are in Evansville, Ind. This company was organized in 1910. The volume of business is centered in fifteen states, including Michigan and Wisconsin on the north, Ohio on the east, Kansas on the west, and south to the Gulf. The officers are C. M. Hardy, president and general manager; R. B. Tyler, vice-president; M. Patterson, secretary and assistant treasurer; S. A. Freschly, superintendent of production; K. O. Johnson, in charge of laboratory; and P. H. McFall, in charge of the machine shop.



General viey of Foley & Beardsley plant, stockpiles at left; material from pit dumped at right.

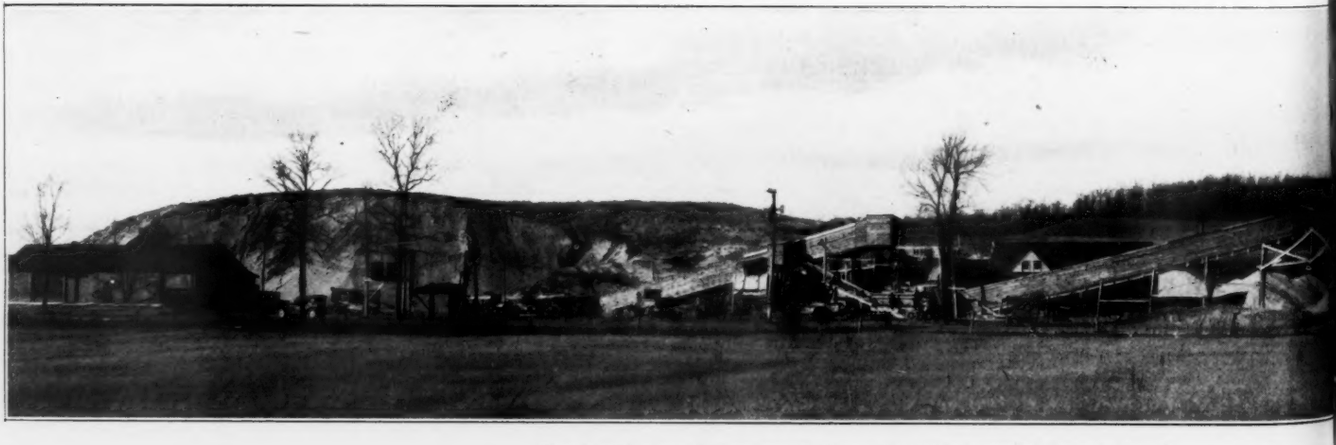
Five Grades of Sand and Gravel Washed in Plant near Pontiac, Mich.

Shipments are Made With Trucks and Trailers from Either Pits or Bins

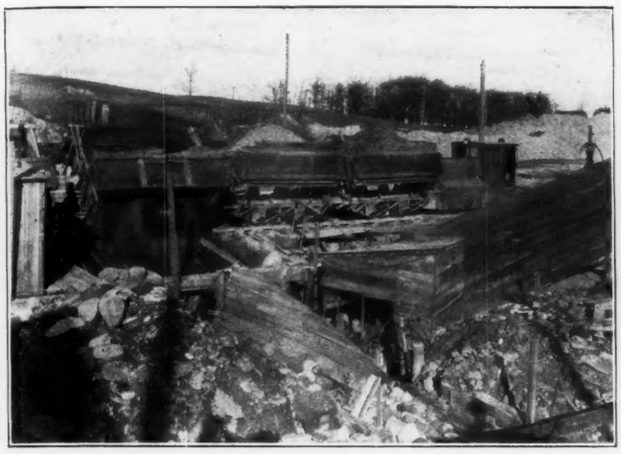
THE FIRM of Foley & Beardslee operates a sand and gravel plant about nine miles north of Pontiac, Mich., along the Dixie Highway. The deposit covers an area of about 250 acres and varies in depth from 40 ft. to 80 ft. There is a soil overburden 2 ft. to 4 ft. in depth which is stripped with a Lorain No. 75 portable gasoline dragline, equipped with a 1¼-cu. yd. Page dragline bucket. The waste material is loaded into two Winsor 4-cu. yd. dump bodies made by the Ohio Locomotive Crane Co., that are mounted upon McCormick-Deering tractors to be hauled an average distance of about 1,000 ft. for disposal.

After the stripping is done, the marketable ma-

Portable crane loading stocked gravel to truck.



Sand and gravel excavated from pit at left are dumped into hopper, and are

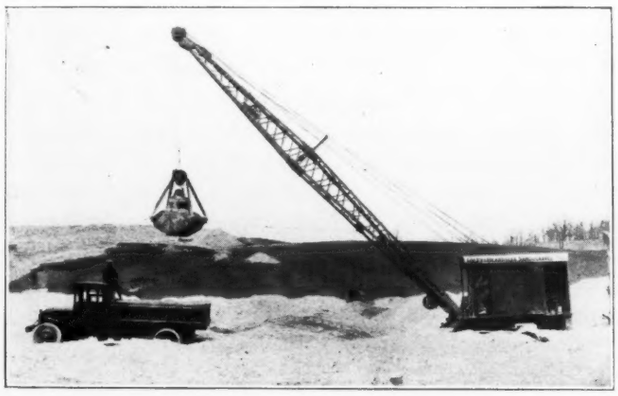


Gravel being dumped from car to grizzly over hopper.

Power shovel loading from bank to side-dump cars.

terial is excavated by a Lorain No. 75 electric shovel with a 1¼ cu. yd. bucket and is loaded into 5-cu. yd. side-dump cars. Two of these cars were built by the Western Wheeled Scraper Co. and eight of them by the Koppel Industrial Car & Equipment Co. In strips of three cars each, the loads are hauled to the hopper of the plant by three 8-ton Plymouth locomotives.

The material is dumped onto a rail grizzly with 5-in. spacings. The throughs pass to a hopper and thence to a Stephens-Adamson 24-in. conveyor with Goodyear belting. The oversize from the grizzly passes to an Allis-Chalmers 12-in. by 24-in. jaw crusher in which it is reduced to 3-in. size. The discharge from the crusher goes directly to the same 24-in. conveyor that handles the throughs from the grizzly, and the whole material is carried up through a long gallery to the Stephens Adamson scalping screen with 2¼-in. openings.



Loading gravel from stock pile to truck for shipment.

The oversize from this screen is fed to an Allis-Chalmers 4K gyratory crusher, which discharges onto a Stephens-Adamson belt conveyor to be returned to the scalping screen. All material must pass this screen before proceeding by another long, inclined Stephens-Adamson conveyor to the washing building.

Three grades of gravel and two grades of sand are prepared on the six 84-in. Stephens-Adamson Gilbert conical screens. The gravel sizes are ¼-in. to ½-in., ½-in. to 1½-in., and ½-in to 2¼-in. Two grades of sand are marketed as sharp sand for concrete work, and fine or flat sand for brick work and plastering.

Water for the washing operation is furnished, at the rate of 2,250 gal. per min., by two Fairbanks-Morse centrifugal pumps. This water is handled through about 750 ft. of 8-in. pipe line to the top of the washing building. Each grade of gravel and sand drops into its respective large bin beneath the screens.

taken successively, by the elevators, to the washing and screening structures.

Grizzly and hopper, and foot of elevator to screening plant.

Stripping overburden and loading trucks with dragline.

The screening department has a capacity of 2,250 tons per 10-hr. day. Two long Stephens-Adamson inclined conveyors are employed to form stockpiles during the summer season, for the winter market. In this manner it is possible to stockpile 15,000 cu. yd. of pebbles and 10,000 cu. yd. of sand.

All shipments are made by trucks which are served advantageously by the adjacent federal highway. When shipments are made from the stockpiles, the materials are loaded into both trucks and Fruehauf side-dump 5-cu. yd. trailers, by a Universal No. 35 crane equipped with a ½-cu. yd. clamshell bucket.

During the summer season, shipments are made from the storage bins, which are sufficiently elevated to permit chute loading directly into trucks and trailers.

Portland Cement Association's Fine Safety Record Praised

The remarkable safety effort, in which practically the entire cement industry, employing many thousands of workers is participating, was recognized at the recent meeting of the Joseph A. Holmes Safety Association in Washington, D. C., when a certificate of honor was awarded to the Portland Cement Association for its excellent work in the course of a campaign against lost-time accidents. In awarding the certificate, it was pointed out that in 1924, the year in which the campaign was started by the Association, in 105 cement plants one plant operated throughout the year without a single lost-time accident; in 1925 two plants out of 118 had no lost-time accidents; in 1926 two plants out of 124 had no lost-time accidents; in 1927 ten out of 136, and in 1928, 17 out of 136 had no accidents of this description. In 1929, 28 out of 153 plants, or approximately one plant in every five, went through the year without a lost-time accident.

The Joseph A. Holmes Safety Association, which is closely affiliated with the United States Bureau of Mines, also awarded a certificate of honor to the Lehigh Portland Cement Co. for its excellent safety work and fine safety record. At least one plant of this company has completed the entire calendar year without a lost-time accident every year except one since and including 1924. In 1928 five plants had no lost-time accident and in 1929 four plants had this excellent record. The company's Iola, Kansas, plant has not had a lost-time accident to any of its more than 200 employees since September 10, 1926, or for nearly 3½ years; and its Ormrod, Pa., No. 3 plant has now gone more than 2 years without a lost-time accident.

It is expected that a number of the large cement companies which are members of the Portland Cement Association will participate in the ninth International First-Aid and Mine-Rescue contest to be held at Louisville, Ky., September 16-18, sponsored by the Joseph A. Holmes Safety Association and the United States Bureau of Mines. Approximately 20,000 workers in the portland cement industry have been trained in first-aid and safety methods by the Bureau of Mines. At 21 large plants every employee has been given this training and the plant awarded a certificate of 100 per cent training by the Bureau.

World Production of Mica Increased 800 Per Cent Since 1900

The annual world output of sheet mica has grown in three decades from 1,250 short tons to more than 10,000 tons, according to the United States Bureau of Mines, which has conducted an economic study of the subject. The world production of scrap and ground mica has also increased greatly, but no figures on the production of scrap and ground mica are available. New Hampshire and North Carolina are the chief producing states. Normally, fully one-half of the American output of sheet mica has come from New Hampshire and more than one-third from North Carolina.

New Bill Before Senate Would Abolish "Recaptured" Rail Income

Measure Presented by Sen. Howell Goes to Very Vitals of Transportation Act

RAILWAY legislation going to the vitals of the Transportation Act is contemplated in a bill originating with the Interstate Commerce Commission for amendment of the valuation and rate-making provisions. The Senate Committee on Interstate Commerce recently referred a resolution by Senator Howell, Nebraska, to the Commission. This brought substitute proposals from the legislative committee of that body; since, by request, embodied by the chairman, Commissioner Eastman, in a bill substantially S.4005 (Senator Howell). Railway presidents and counsel are now studying the provisions preparatory to adopting an attitude.

The outstanding changes aim:

1. To stabilize and clearly define the "rate base," which supersedes "property value."

2. To abolish "recapture," letting each road spend the government half of income above 6 per cent on its own property or for extinguishment of fixed debt.

The Rate Base

"In order," says the Howell bill, "to provide a basis for the administration of the provisions of this section which will be stable, which can be readily determined and effectively used, and which will also, as a result of its use, enable and induce the carriers to supply the transportation needs of the country without undue imposition upon the public served, the Commission shall, from time to time, and as often as may be necessary, determine a rate base for each operating carrier, as of any given date."

The "rate base" is designed to terminate the perennial controversy over "valuation." When the late Senator LaFollette proposed a property valuation his argument was that the roads were overcapitalized and enjoying an income so high per cent on the actual value that once this was officially stated public opinion would demand reduction in rates. After many years, tentative valuation of one system after another began to be announced by the Commission, indicating that quite generally these "values" would substantially exceed the capitalization. This led to proposals, incessant ever since in Congress and out, for one or another change in the valuation method to produce some basis which would warrant rate reductions. It has often been pointed out that to serve the public and prepare for expected traffic growth the railroads must earn a certain number of dollars of net railway operating income and that if the valuation were cut down the rate of fair return would have to go up; that no railroad and no commission ever has paid the slightest attention to valuation in rate adjustments. Advocates of rate reductions through lowered valuations have nevertheless persisted in their program, which reached a climax in the opposition to confirming Charles E. Hughes as Chief Justice, developing into a general attack upon the Supreme Court for its allegedly reactionary course in railroad and utility rate cases.

The Transportation Act, 1930, ignored capitalization, setting up property value as the base upon which to compute as "fair" a return at a rate announced by the Commission, and to compute income exceeding 6 per cent, half of which is to be paid to the government ("Recaptured," to use a popular term not appearing in the statute.) Congress fixed 6 per cent as the rate of fair return for two years, after which the Commission fixed it at 5¾ per cent, where it has been since left, chiefly in fact effective as a yard stick for use of those who observe income trends for investment or rate adjustment purposes. The Commission itself has never adopted the practice of publishing from time to time, with supporting estimates, the amount of income which it deems essential in the public interest. Recapture of half the income exceeding 6 per cent, however, is a definite statutory duty. Interpreting the valuation provisions for that purpose the Commission arranged for a valuation test case involving the recapturable income of a small road, the O'Fallon. The Supreme Court criticized the Commission for ignoring in the O'Fallon valuation the cost of reproduction new, due consideration of which the law prescribes. The Court in this instance was not telling Congress what law it had the power or the obligation to pass but telling the Commission what law Congress in fact had passed. If the Commission heeds this admonition the effect of its change in the valuation method could only be to increase the ultimate valuation of all roads; and while, as President Hoover observed, no advance in freight rates need be expected as a result of the Supreme Court decision, a certain number of systems could retain some income at least above 6 per cent which would be recapturable

if the O'Fallon method were to stand. Senator Howell promptly introduced a resolution making the O'Fallon case the base for all roads. This was followed by the exchange with the Commission and the introduction of S.4005.

One reason why the Commission avoided giving due consideration to the cost of reproduction new, although plainly mandatory, was that everybody wants stability in railroad rates and since prices of what the railways buy fluctuate widely, an assignment of heavy weight to reproduction new as an element of value would drive value up and down with business boom and slump, and freight rates with it.

Under the Howell bill the Commission would determine as of the given date for each carrier an amount "representing the property which it owns and which is used in the service of transportation." Such property would be booked under two heads—property in general and a newly-created "public investment account," arising from additions and betterments paid for out of the government half of income over 6 per cent. The rate base is to be computed by adding certain items together and deducting others. The items added together are the cost of reproduction new, other than of land, on the date when the Commission made the original valuation under the Transportation Act, and the land as so originally valued. To or from this sum would be added or deducted the net increase or decrease to date since the original valuation (except property in the "public investment account"). The final deduction is depreciation.

Spend Recaptured Income

The new method of dealing with income in excess of 6 per cent is intended as a compromise. Discontent has been manifested for many years in some quarters over allowing a return on property representing the investment of earnings. This argument was a talking point for those who opposed rate advance sanctioned primarily to rescue perishing railroads but benefiting stronger roads in the same territory which enjoyed the same rates. To this it was replied that if the rates were unjust or unreasonable they ought not be permitted, and if they were just and reasonable any road operating under them was entitled to keep all it could earn. Thinking to meet each of those views halfway, Congress in the Transportation Act authorized a rate level designed to keep in full vigor the average road in a group and to limit income by recapture. The Eastman proposal goes a step further. The railroads having complained that their rightful income is taken away from them, and the government fund, originally intended to be used in aid of weak lines, never once having been so applied because its terms were obsolete from the outset, Mr. Eastman says: "Very well, hereafter every road may spend on its own system the government half of its income over 6 per cent." Some having complained that earnings plowed back in should not be added to the rate base, he says: "Very well, half the income over 6 per cent when plowed back in will not be added to the rate base."

A defect in the Transportation Act, apparently inadvertent, correction of which has long been urged when amendment should be timely, is the computation of recapturable income annually. The effect is that a railroad cannot use for maintenance in a lean year earnings realized in a fat year. Having expended in the fat year for maintenance and other operating expenses that year's quota, the carrier must report the balance as income, and if it exceeds 6 per cent half the excess is seized. The next year there may be no income, or a deficit. Stabilization of purchases and of employment has been cited as an object to be sought by averaging the income over a five or three-year period. S.4005 lengthens it to two years, which some railway executives are understood to think would appreciably relieve the situation.

Extinguishment of Debt

Among other innovations proposed by S.4005 one would give the Commission original jurisdiction over railways' complaints of rate levels so low as to impair their constitutional rights. Court review is preserved.

Still another departure looks to progressive extinguishment of funded debt. As in the present act, the carriers' half of the income above 6 per cent goes for dividends and interest or rent for leased roads, but when the accumulated balance exceeds 5 per cent of the rate base such excess "shall be used for the purpose of liquidating fixed obligations, either in conformity with the terms thereof or by the purchase of the carriers' securities in the open market."

The National Industrial Traffic League, through its executive committee, has gone on record against the bill. It is stated that representatives of the league will appear in opposition to the measure when hearings are held by the Senate Interstate Commerce Committee.

Fulfils Its Purpose

Please enter a renewal subscription for PIT AND QUARRY for one year and for P. and Q. Handbook. We think PIT AND QUARRY answers our purpose very well. Here's to a successful year for PIT AND QUARRY during 1930.

C. P. Mitchell, *Supt.*,
Monarch Cement Co., Humboldt, Kan.

Albany, N. Y. Cement Safety Meeting Draws Attendance of 125 Delegates

Catskill Plant of North American Cement Corp. Awarded First-Aid Contest Trophy

WITH a registration of 125 delegates, representing portland cement mills in New York, Maine and Quebec, the annual regional safety meeting of this area was held on Tuesday, April 15, at the Hotel Ten Eyck, Albany, N. Y. The meeting, sponsored by the committee on accident prevention and insurance of the Portland Cement Association, was the eighth of a series being held this year throughout the United States.

R. B. Fortuin.

F. P. Monaghan, works manager of the Glens Falls Portland Cement Co., was general chairman of the day's program. The morning events included a report on safety work by A. J. Curtis of the Portland Cement Association and three talks:

"Good Housekeeping As An Aid to Safety," by G. H. Hummel, Lone Star Cement Co., Hudson, N. Y.

"What Kind of a Safety Talk Should a Foreman Give His Men?" by R. B. Fortuin, Assistant to General Manager, Penn-Dixie Cement Corp.

"Weather Hazards and Their Control," by Jack Dempster, Canada Cement Co., Ltd.

Luncheon was enjoyed at noon in the Band Box room of the Ten Eyck, with F. W. Kelley, president, North American Cement Corp., serving as toastmaster. The speaker at the table was James E. Gheen, executive secretary of the Albany Chamber of Commerce.

The meeting reconvened at 2 o'clock, opening with an address by James A. Pisarri, district director of the New York State Bureau of Rehabilitation. The remainder of the afternoon session was taken up with a first-aid contest which was won by the team representing the Catskill, N. Y. plant of the North American Cement Corp., with a score of 97.25. The other three participating teams with their scores and order of finishing, was: Howe's Cave, N. Y. plant, North American Cement Corp., 95.25; Glens Falls Portland Cement Co., 94.25; and Lone Star Cement Co., New York, 92.37. As the close scoring indicates, the contest was a spirited one, the victors having been awarded a silver cup, the contribution of George Bayle, Jr., vice-president of the Glens Falls Portland Cement Co.

Morris Fortuin, general manager of the northern division of the Pennsylvania-Dixie Cement Corp., was the toastmaster at the safety dinner in the evening. The principal address was delivered by Harry N. Holmes, field secretary of the World Alliance.

The committee on arrangements of the meeting, which was one of the most successful of the year in the points of enthusiasm and attendance, was as follows:

F. P. Monaghan, works manager, Glens Falls Portland Cement Co.
A. C. Brown, superintendent, Alpha Portland Cement Co., Cementon, N. Y.
E. L. Boyne, superintendent, Alpha Portland Cement Co., Jamesville, N. Y.
R. A. Dittmar, works manager, Universal Atlas Cement Co., Hudson, N. Y.
E. French, superintendent, Canada Cement Company, Ltd., Hull, Quebec.
A. G. Beck, superintendent, Canada Cement Company, Ltd., Montreal, Can.
J. A. Creasor, general manager, National Cement Co., Montreal East, Can.
A. L. Wolf, superintendent, Lawrence Portland Cement Co., Thomaston, Me.
C. S. Andres, superintendent, Lone Star Cement Co., New York, Hudson, N. Y.
H. F. Kichline, superintendent, North American Cement Co., Catskill, N. Y.
S. H. Rhodes, North American Cement Co., Howes Cave, N. Y.
E. Snyder, superintendent, Lehigh Portland Cement Co., Alsen, N. Y.
F. P. Werner, superintendent, Penn-Dixie Cement Corp., Portland Point, N. Y.

The following mills participated in the meeting:

Alpha Portland Cement Co., Cementon, and Jamesville, N. Y.
Atlas Portland Cement Co., Hudson, N. Y., Montreal, Que., and National (Quebec), Hull, Que.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
Lawrence Portland Cement Co., Thomaston, Me.
Lehigh Portland Cement Co., Alsen, N. Y.
Lone Star Cement Co., New York, Hudson, N. Y.
North American Cement Corp., Catskill, and Howe's Cave, N. Y.
Pennsylvania-Dixie Cement Corp., Portland Point, N. Y.

Pointing out means of controlling weather hazards in accident prevention was the keynote of the talk made by Jack Dempster of the Canada Cement Co., Ltd., at the morning session. Mr. Dempster said, in part:

"January has always appeared to be a bad month in the cement industry, for a number of reasons. I say 'appeared to be' for we can not lose sight of the fact that plants who have operated without a personal injury for three consecutive years have operated through three January's as well as three June's. However during January considerable repair work is in progress, men are temporarily shifted from one department to an-

Jack Dempster.

other and in many instances do work with which they are not familiar. In February, more especially in the northern and eastern part of this continent, we have severe winter weather and in Canada, perhaps, a little more so. Our quarry faces and floors are icy and snow-covered and walking is treacherous. For that reason we are compelled to take greater precautions when secondary shots are fired, so that men will have not only more time to seek shelter, but that they will have a safe path over which to hurry. We get a sample of nearly every kind of weather in March, and that factor is what causes so much trouble. Snow, thaw and ice, following one upon the other, creates a series of conditions that call for constant vigilance. Men have been killed by the ice and snow sliding from sloping roofs.

"April is only a nice month in the mind of the spring poet. We get lots of rain for one thing, and rain can cause exciting moments around electrical apparatus or machinery operated by electricity. There is the prevalence of 'grounded' wires, motors, iron and steel work and poles, and switches and controllers are not always protected.

"When the wind is unleashed, it forms a real hazard, doesn't it? I remember a wind storm in May, when large pieces of caked dust from the roofs were flying through the air, and a part of the corrugated-iron sheathing of a building sailed along quite a number of feet before it hit the ground. We even have on record the case of a man who was caught when the wind slammed a heavy door shut on his fingers, breaking two of them and amputating a third. In June we have a number of factors that, for many years, increased our accident toll. Our shipping and production conditions are generally at their peak and, coupled to these, is the condition of excessive heat. This toll was so bad a few years ago that the Portland Cement Association inaugurated a special endeavor to reduce accidents in June, and those behind the movement found that, like all other hazards against which a determined drive is directed, a very great reduction in accidents could not only be made in that month, but that the months following showed a reduced list of injuries also. Excessive hot weather causes a lot of trouble. When a man is uncomfortably cold, he is stimulated to work hard, exercise, and restore the glow of warmth, but when he is exhausted by continual and excessive hot weather and accompanying humidity, he is liable to become a hazard to himself and those around him.

"The late summer months and the autumn can surely give us an opportunity to get rid of some conditions that aid the bad weather to create hazards. If we make sure that the approaches to our working points are clear and easy of access, and that loose rock or material lying around is cleared up, when these places are covered with snow and ice, no unseen trap will render the precautions of no account that you have taken to cope with the known dangers of slipping, sliding and falling. Ice in cracks is a tremendous force which sometimes rips over-hanging rocks from the quarry face and sends them hurtling below, and frost will tend to put a clay bank into position to slide when it is thawed by the sun. If these conditions can be foreseen and proper precautions taken, men will not be injured by such hazards.

"In actual operation, inside the buildings of the plant, we can hardly say that the weather creates any untoward effect or increased hazard, but at least all entrances can be kept clear and outside stairways clean so that snow or rain will not interfere with the passage of the worker from one point to another. No matter how careful a man may be, he cannot prevent ice and slush from forming on outside walks, but every man can adapt himself to these conditions. It is our own duty to exercise care on slippery surfaces. A thorough housecleaning in the yard and outside of buildings is as necessary in the Fall as in the Spring, if not more so, because cleaning is not likely to be done after the snow falls and partially hidden objects may cause bad falls later on. If there is a stairway or elevated walkway that needs a railing, this should be done before weather conditions have helped a man to fall and break a leg.

"We cannot control the weather nor conditions arising from the weather, but we can most certainly control the frequency of human injuries resulting from these conditions.

"Out of a list of seventeen major industries in 1929, the National Safety Council has rated the Portland cement industry as having the lowest accident frequency."

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

W. R. DUNN
Assistant to President and Manufacturing Director,
Vulcanite Portland Cement Co.
Phillipsburg, N. J.

Personal Mention

C. D. Prickett, vice-president and director of the Hercules Powder Co., was the honored guest of Russell H. Dunham, president of the company, at a recent dinner attended by the members of the Hercules Board of Directors, in celebration of Mr. Prickett's fiftieth year of service in the explosives industry.

Col. Robert I. Randolph, president of the engineering firm of Randolph & Perkins, and president of the Chicago Association of Commerce, was the speaker at the weekly luncheon, April 10, of the Western Society of Engineers, meeting at the Hotel Sherman, Chicago. Col. Randolph spoke on "The Engineer in the Building of Chicago."

Ian Duncan, who recently completed a special course in the Quincy, Ill., plant of the Gardner-Denver Co., has been sent to Santiago, Chile, where he will represent this company.

Richard B. Hynes, formerly assistant secretary and assistant treasurer of the Atlas Portland Cement Co., has been appointed secretary of the new Universal Atlas Cement Co. Mr. Hynes was in the secretary's department of the former Atlas organization since 1916. Since 1925 he was assistant secretary and assistant treasurer of both the Atlas Portland Cement Company and of its subsidiary, the Atlas Gypsum Corp. **T. E. O'Connor,** previously western credit manager for the former Atlas company, has been appointed treasurer of Universal Atlas. **A. J. Joyce,** formerly assistant credit manager of the Universal company, has been appointed assistant treasurer at Chicago of Universal Atlas. **E. M. Johnson,** for twelve years eastern credit manager of the former Universal company, has been named assistant treasurer at Pittsburgh of the new company. **J. L. Medler,** member of the former Atlas organization for 28 years and its assistant treasurer since 1911, is named assistant treasurer at New York of the Universal Atlas company.

W. H. Dutcher, for nearly 24 years purchasing agent for the former Atlas Portland Cement Company, has been appointed purchasing agent for Universal Atlas.

M. E. Crosby, for the last three years chief engineer of the Burrell Engineering & Construction Co., Chicago, has been made chief engineer of the Macdonald Engineering Co., Chicago. His experience in the design of cement and flour mills has been very extensive.

A. W. Daniels

A. W. Daniels has been elected vice-president in charge of sales of the American Manganese Steel Co. For seven years prior to entering the employ of the company as assistant to the industrial engineer at the Chicago Heights plant, Mr. Daniels traveled extensively as a commercial representative. In 1920 he became the Chicago office manager. Two years later he was promoted to central sales manager, which position he occupied but one year before his appointment in 1923 as general sales manager of the American Manganese Steel Co.

A. T. Ward has been appointed regional sales manager in charge of Eastern territory for the Productive Equipment Corp., manufacturers of the Jigger vibrating screen. His office is located at 50 Church St., New York. All export business will also be handled from this office.

B. Van Dyke, of the Quincy, Ill., sales division of the Gardner-Denver Co., has been transferred to the New York office of the organization. **Hendrick Stolk,** until recently with Stoksvis and Zonen, of Holland, has just been transferred to St. Louis from the Quincy plant where he completed a sales study course.

R. B. Palmer, Jr., has been placed in charge of the New York office of the O. K. Clutch & Machinery Co., located at 55 West 42nd Street.

R. E. Jones, owner of the Trevis Sand & Gravel Co., of Austin, Tex., is planning the construction of another plant near Austin, it is reported.

Ismar Ginsberg, consultant chemical engineer and expert in the use of material, has announced the removal of his offices to the Aeolian building, 33 West 42nd Street, New York, N. Y.

Max Forrer of Gypsum, O., has been named general manager of the Lancaster, O., plant of the United States Gypsum Co.

Robert Orndorff and **O. H. Schooler,** both of Portland, Ore., have purchased limestone deposits near Northport, Wash., which are to be developed shortly.

E. E. Duffy, publicity writer of the Portland Cement Association, has returned to Chicago after an extended trip through the South in the interests of the Association.

R. C. Bird, well known in the cement industry through years of service in designing and installing cement plants and machinery, has been made sales engineer of the Chicago Steel Foundry Co., Chicago, Ill.

William B. Newberry, member of the board of directors of the Medusa Portland Cement Co., Cleveland, O., has resigned. He has been succeeded by **Frederic Pickford,** assistant secretary of the company.

George W. Browse is the new plant superintendent of the West Penn Sand & Gravel Co., at Rochester, Pa. Mr. Browse was formerly of New Martinsburg, W. Va.

Fred B. Hamilton has sold his quarry and sand pit at Bellefontaine, O., to **E. G. Buchsieb** of Columbus, Ohio.

W. R. Talbot recently began developing a silica sand deposit in Frederick County, Virginia. The deposit covers about 100 acres.

Obituary

James H. Cook, 65, died suddenly March 20 at his home in Swampscott, Mass. Several weeks ago he went to Detroit on business and was obliged to return because of illness. Mr. Cook was founder and head of the Hartford Sand & Stone Co. and of the Lynn Sand & Stone Co. He was born in Plainville, Conn. Besides his widow, he leaves a son, two daughters, and four grandchildren.

Robert Boyd Hill, 50, fiscal agent of the National Portland Cement Co., died at Harlingen, Texas, recently as the result of a fractured skull sustained in an automobile crash. Mr. Hill was born in Angelina County, Texas, and had lived in Dallas several years.

Influence Reflected in Growth of Circulation

The growth of reader interest in PIT AND QUARRY is well shown by the steady increase in the number of its paid subscribers. Every branch of the non-metallic mineral industry—cement, gypsum, lime, sand, gravel, stone, and other less common minerals—is represented in the additions that are continually being made to PIT AND QUARRY'S list of paid subscribers. With the publication of every issue come scores of new readers—men who are responsible for important phases of their businesses, whether production, sales, or management.

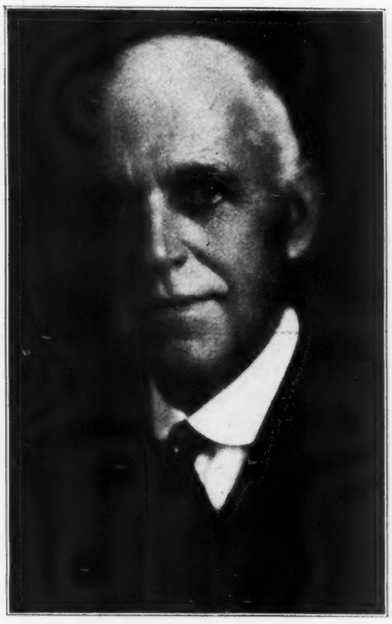
As a result, PIT AND QUARRY not only continues to be the most widely read and the most widely bought paper in its field, but its position of leadership is becoming steadily more pronounced. Thus, during the period covered by the publication of only four of the latest issues of 1930, its gain in paid circulation has been considerable. Between the issues of January 29 and that of March 26 (the last issue for which accurate data are available) the paid circulation of PIT AND QUARRY increased approximately 7 per cent. Considered in connection with PIT AND QUARRY'S paid-circulation growth in previous months, this figure shows very clearly a growing interest on the part of producers in the trade journalism of their industry and an increasing dependence on PIT AND QUARRY as the most influential paper in their field.

Census Director Urges Quarries Reply Promptly

In an effort to expedite and improve its complications, the Director, William M. Stewart of the Bureau of the Census is urging all operators to fill out their questionnaires accurately and promptly in the current Census of Mines and Quarries. This census, which is one of the series of decennial censuses extending back more than three-quarters of a century, is being conducted so far as possible by mail, and each operator is asked to return his report within 15 days after receiving the form.

An unusual effort is being put forth to take this census more promptly and accurately than any prior census has been taken. Since the benefits of the census come chiefly to the mine and quarry operators themselves, they are being depended upon to assist in the endeavor through wholehearted cooperation, and the results depend on the care and promptness with which every mine or quarry operator fills out the questionnaires.

Answers to the questions are required by law, but the Bureau of the Census is compelled to hold all information in strict confidence, even from other departments of the government. The information can not be used in the assessing of taxes of any kind. Furthermore, the data gathered



William M. Stewart

will be published in such form that individual operations will not be revealed. Each mine and quarry operator will become merely a unit of a group of such operators of a given classification.

The only classes of mineral producers not covered by the census are the following:

Establishments which were closed or idle during 1929 and those which were abandoned or dismantled prior to January 1, 1929; establishments whose annual output was valued at less than $2,500 or in which the amount spent on development work during 1929 was less than $2,500; small bituminous coal banks producing less than 1,000 tons annually; itinerant individual placer gold miners and miners hunting for precious stones, who employ no help; prospectors; and salt mines and plants producing salt from sea, lake or well brines.

General Refractories to Insure All Employees

The General Refractories Co., Philadelphia, Pa., recently adopted a cooperative group insurance plan for the benefit of all its employees, through contract with the Metropolitan Life Insurance Co. The plan offers benefits to over 3,500 employees, it being estimated that the total life insurance coverage approximates $4,000,000. In the case of non-salaried employees the plan provides for health and non-occupational accident benefits in addition to life insurance.

Employment Department A Service to Industry

Finding the best men for positions of responsibility continues to be one of the biggest problems faced by producers in the non-metallic mineral industry. Reduced demand, increased competition, price instability, and other factors have made the acquisition of the most capable men a matter of greater importance than it has been under more favorable conditions.

PIT AND QUARRY has been privileged to serve both employer and employee in this vital question of finding the man for the job and the job for the man. During recent weeks this journal has assisted in placing several capable men in key positions. A stone-quarry superintendent; a research engineer for a cement plant; a production manager for a concrete-products plant, and a general superintendent for a chain of sand-and-gravel plants are among those who have been placed through PIT AND QUARRY'S aid.

Producers in search of capable executives, efficient managers, and experienced engineers and superintendents are greatly helped by PIT AND QUARRY'S Employment Department. The current list of men available includes a ready-mixed concrete-plant manager; a lime-plant superintendent; a cement-plant superintendent; a laboratory man; a chief engineer for cement manufacture; and many other men of similar capacity. The department's work is conducted as a complimentary service to PIT AND QUARRY readers.

World's Largest Building Had Huge Mixing Plant

For the construction of the world's largest building — the Merchandise Mart, Chicago, Ill.—the contractors erected a temporary but complete concrete-mixing plant. Although it furnished concrete for but one great structure, the distribution of the concrete was to such considerable distances and elevations that the outfit was termed a central mixing plant. More than 140,000 cu. yd. of concrete were mixed here.

Refractory Manufacturer Organizes New Division

The Laclede-Christy Clay Products Co., of St. Louis, Mo., has organized a cement and lime industry division which will be directed by J. A. Kayser, sales engineer for the company. Mr. Kayser is an authority on refractories and has made a special study of conditions in the cement and lime industries. According to the announcement, Mr. Kayser will be at the service of all operators for any information desired.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Blasting

"Tunnel Blasting in Quarries." 8 p., 7 ill. (*The Dupont Explosives Service Bulletin*, Jan., 1930. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.) Describes and illustrates approved methods of tunnel blasting.

Concrete Machinery

Colorcrete—the New Gateway to Money-Making Opportunities. 24 p. Illustrated in color. (Colorcrete Industries, Holland, Mich.) Describes and illustrates machinery for the manufacture of ornamental concrete products and pictures the concrete units which may be produced.

Conveyors

Rex-Stearns Belt Conveyors. 96 p. (Catalogue No. 188. The Stearns Conveyor Co., Cleveland, O.) A catalogue and engineering data book dealing with equipment for making belt conveyor installations.

"S-A Equipment for Handling Fuller's Earth." 8 p., 6 ill. (*The Labor Saver*, March, 1930. Stephens-Adamson Mfg. Co., Aurora, Ill.) Describes and illustrates the application of belt, screw and shuttle conveyors in handling fuller's earth by a large oil refining company.

Crushers

375 *yards—or* 550? 4 p., 4 ill. (Wisconsin Foundry & Machine Co., Madison, Wis.) A mailing piece describing and illustrating a roller bearing crusher and crushing rolls.

Eagle Equipment. 8 p., 10 ill. (Eagle Iron Works, Des Moines, Ia.) Describes and illustrates crushing and pulverizing equipment and its application to the various industries.

Drag-Shovel Attachments

Page Drag Shovel Attachments. 16 p., 19 ill. (Bulletin No. 900. Page Engineering Co., Chicago, Ill.) Describes and illustrates a device for improving the digging and dumping action of a drag shovel.

Electrical Equipment

Motors, Generators, Compressors, etc. 68 p., 46 ill. (Bulletin No. 37. Rockford Power Machinery Co., Rockford, Ill.) Lists and describes rebuilt electrical equipment of a wide variety at low cost, backed by the guarantee of this prominent company.

Excavating Machinery

Know the N. E. C. (National Equipment Corp., Milwaukee, Wis.) A colorful broadside illustrating and listing the 54 items of equipment handled by this organization.

Metals

Notes on Uses of Nickel Cast Iron. 32 p., 61 ill. (The International Nickel Co., New York, N. Y.) Describes and illustrates the application of nickel cast iron to various kinds of machinery.

Mixers

The Broughton Mixer. 20 p., 15 ill. (Catalogue No. 2M. The Dunning & Boschert Press Co., Inc., Syracuse, N. Y.) Describes and illustrates various types of mixers for numerous materials.

Pumps, Centrifugal

Centrifugal Pumps. 24 p., 41 ill. (Bulletin 295. Byron Jackson Co., Berkeley, Calif.) Describes and illustrates in detail the various centrifugal pumps made by this concern and notes early installations of this type of pump.

Scales

Beginning the Second Century. 20 p., 37 ill. (Fairbanks, Morse & Co., Chicago, Ill.) An institutional brochure in colors tracing the development of weighing equipment made by this company during the past 100 years.

Shovels

"How the Pacific Coast Gets Its Salt." 4 p., 2 ill. (*Link-Belt Shovel News*, March, 1930. Link-Belt Co., Chicago, Ill.) Describes and illustrates salt-handling methods of the Alviso Salt Co., Alviso, Calif.

Excavating and Material Handling Equipment. 8 p., 10 ill. (Universal Power Shovel Co., Milwaukee, Wis.) Describes and illustrates a new unit shovel, giving specification and construction details.

History Repeats Itself. 4 p., 4 ill. (Bucyrus-Erie Co., South Milwaukee, Wis.) Describes and illustrates 3-engine shovels and points out their apparent advantages.

Tractor Equipment

W-K-M Tractor Equipment. (W-K-M Co., Inc., New York, N. Y.) A loose-leaf booklet describing and illustrating a side-boom unit for attachment to crawler-mounted tractors and showing its application in the pit-and-quarry field.

Trucks, Motor

Trucking Costs and How to Lower Them. 48 p., 19 ill. (Relay Motors Corp., Lima, O.) An analysis of motor-truck costs, with instructions and suggested forms for record keeping.

Trinity Cement Plant to Install Robot Railway

Railway cars without passengers and apparently running without human agency, will transfer cement rock from the excavating pit to the crusher on a railway haulage system soon to be built by the Trinity Portland Cement Co. of Dallas, Texas. A novel system of remote control, devised by the General Electric Co., will govern the operations of the cars.

Raw materials are excavated at some distance from the crusher at this plant. An inexpensive method of haulage was needed, and General Electric engineers were called upon to solve the problem. The "riderless larry car" system, previously applied by that company to another installation, was adapted for the purpose.

Two operators, located where they can view the loading and unloading of the cars and their movements, are enabled by this system to govern practically all the operations of the cars. The track on which the cars will run will be divided into a number of sections. Four motor-driven cars will ride over the track, each propelled by two 50-hp., squirrel-cage motors. Energy for driving the motors will be collected from the track and an extra rail system. Switches in front of the centrally-located operator will control the delivery of energy to each section of track. Thus, by energizing all the sections of the track, the cars will run from one end to the other.

The cars will be stopped by interrupting the electric current to the section on which the cars are traveling. Electric solenoid brakes, operating automatically when the current is turned on or off, will stop the car when the energy supply is interrupted. The direction of travel of the cars on any section can be changed as simply as the current can be turned on or off—merely by throwing a switch.

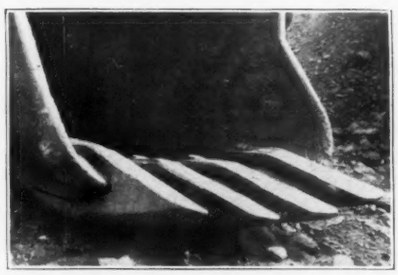
The use of induction motors is new for such applications. Direct-current motors are usually employed for such service. The dump cars to which the electric drive will be applied are being built by the Atlas Car & Manufacturing Co.

Lincoln Electric Opens Three Branch Offices

The Lincoln Electric Co. of Cleveland, Ohio, has announced the opening of new offices in Saginaw, Mich., Fort Wayne, Ind., and Oil City, Pa. The Saginaw office is located at 338 Barnard St., and is in charge of J. E. Luter. The Ft. Wayne office is in charge of D. H. Carver, and is located at 225 E. Columbia St.; E. D. Anderson is in charge of the new office in Oil City, Pa.

Application of Wear-Resisting Metals to Wearing Surfaces

ASIDE from the petroleum industry which was the first activity to take advantage of welding in the application of metal as a resistance to wear, the non-metallic mining industries have been most active in and have secured the greatest benefit from this process. At the start, the various branches of the nonmetallic industry were hampered in the successful adoption of welded-on overlays by the fact that materials utilized in the petroleum industry were not al-



Dipper teeth with resistant overlay.

together suited to their requirements, but with the later developments there has come complete success. Today, power shovel teeth, dipper lips, mantels and the various other parts of material handling and excavating machinery are being successfully overlayed with a resultant lengthening of their useful life.

Since the process utilized for depositing these wear-resisting overlays is the identical process practiced in autogenous fusion welding, there is little need for detailing the method of application. Either the Oxy-acetylene torch or the electric welding arc may be utilized with equal success and the process simply consists in covering a desired area with an overlapping series of welding beads. Regarding the various products and their individual successful applications, however, there is much to be said. Heretofore, hardness has been the one property of the overlay considered all-essential. Today, hardness is utilized only as a secondary comparison and resistance to abrasion has been secured without sufficient hardness to hamper by its accompanying brittleness. In the non-metallic mining industries application, resistance to wear is all that is required and brittleness is very detrimental to success.

With the lone exception of manganese steel, overlays should be applied to clean, preheated metal. In the instance of manganese steel which may months ago, and later sold to Harden and Henderson, local capitalists, includes approximately 500 acres, owned be very successfully overlayed, the metal should be clean, but, instead of being heated at the time of the application, the metal should, both during and following the application, be kept as cold as possible by an occasional drenching with cold water. Overlaying is actually the pouring on of a layer of fluid metallic alloy which will thoroughly amalgamate with the surface of the parent metal and will cool to a wear-resistant surface.

Many separate overlay materials are marketed and each is suitable for use under specific conditions; moreover, each is recommended to be applied by a specific course of procedure. Yet, each material and each process is patterned after the same basic principle and if the material is not too hard, so that it will be found too brittle to withstand the service and if it is applied so that it will amalgamate well with the metal overlayed and will not chip or loosen off, it should prove successful when used for non-metallic mining industry requirements.

In searching about for or in determining what is the application suitable for overlaying, the one deciding factor is: To what sort of wear is the part subjected and is it more economical to overlay the part or renew it? Ordinarily, any machine part may be overlayed with resultant economy, so, it may be asserted that any metallic part subjected to wear may and should be overlayed. Regarding the sort of wear, there is much to be said. Star-drills, for example, working in hard rock, have rarely, if ever, been successfully overlayed. On the other hand, star-drills, working in coal or in softer formations, have been overlayed and their useful life prolonged many times the capacity of unoverlayed drills. Dipper teeth are being overlayed with greatest success, as are bucket lips, dredger teeth, dredger pump impellers and such equipment. Crusher mantles are overlayed wherever the material crushed is not of too hard a consistency. At the present time, the overlay materials will withstand little pounding but, little by little, this fault is being corrected and, soon, overlay materials will be developed which will withstand all manner of abuse and hard usage.

Summing the progress made so far, welded-on overlays of wear resisting alloy have already proved their worth to the non-metallic mining industries and the universal adoption of the process with a consequent lessening of machine and machinery obsolescence depends almost, if not entirely, as much upon the development of the process in various applications as upon the development of the materials for the process.

A. S. T. M. Committees Gather at Detroit, Mich.

The annual spring group meeting of committees of the American Society for Testing Materials was held at the Book-Cadillac Hotel in Detroit, March 17 to 21, inclusive. This plan of holding a number of committee meetings over consecutive days, which is probably unique in the activities of this Society, has worked out very successfully, conserving the time and expense of those members serving on a number of committees. The committees met throughout all the five days, starting with sessions in the morning and extending through the afternoon and evening with but one break, a dinner on Wednesday evening.

In all 23 committees of the Society took part, but with the many sub-committee meetings that were necessary, the number of meetings held during these five days totalled approximately 125. About 500 were in attendance.

The group meeting was held in conjunction with the Detroit Regional Meeting, a meeting arranged by the Detroit District Committee comprising two technical sessions at which a number of papers were presented covering materials of interest to the automotive industries and a dinner in the evening. The Regional Meeting contributed largely to the high attendance and gave to the meetings an atmosphere of a general meeting of the Society. Over 700 were present at the dinner, including a number of guests from the local sections of the Society of Automotive Engineers, the American Society for Steel Treating and the National Association of Purchasing Agents.

American Stone Company Abandons Old Quarry

The American Stone Co., of Lima, O., has abandoned its old quarry near that city and has moved its plant and equipment to a new deposit nearby. E. G. Baker is superintendent for the company and directed the transfer of the plant.

Recent Patents

AMERICAN

Concrete Mixing

Concrete mixer. Erich H. Litchenberg, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,753,-831.

Mixer for cement. Jack M. Owen, Long Beach, Cal. No. 1,753,716.

Mixer-shell for transit mixers. Edward T. Tuller, Oakland, Cal., assignor to Transit Mixers, Inc., San Francisco, Cal. No. 1,753,730.

Automatic concrete-mixing machine. George E. Webb, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,753,324.

Portable concrete mixer. Reginald A. Daddisman, San Francisco, Cal., assignor to Barrymore Concrete Mixer Corporation, same place. No. 1,753,311.

Electrical Apparatus

Electric magnetic hydro-carbon accelerator (for power shovels). Joseph B. Newton, Roseville, Cal. No. 1,753,-617.

Excavating

Bucket excavator. Earl P. Shnable, Chicago, Ill. No. 1,752,510.

Excavator-dipper latch. Alfred T. Hansen, Green Bay, Wis. No. 1,753,-513.

Excavating tooth. Lesher W. Van Buskirk, Easton, Pa. No. 1,753,392.

Gypsum Products

Process of producing cellular building material. George M. Thomson, Caledonia, Ont., assignor to Canada Gypsum & Alabastine, Ltd., Paris, Ont. No. 1,753,255.

Measuring

Automatic measuring hopper. Harry H. Barber, Aurora, Ill., assignor to Barber-Greene Co., same place. No. 1,753,546.

Pulverizing

Discharge means for tube or ball mills. Paul Bodenstein, Madgeburg, Germany. No. 1,753,685.

Grinding, pulverizing, or disintegrating mill. Walter A. Cloud, Chiswick, London, England. No. 1,752,-888.

Mill. Adolf Steinbruckner, Duisburg, Germany. No. 1,752,860.

Mill pulverizer. John P. Polster. Alton, Ill., assignor to Illinois Stoker Co., same place. No. 1,753,474.

Pulverizing or grinding mill. David J. Uhle and Joseph V. Durnin, Allentown, Pa. No. 1,752,314.

Pulverizing or grinding mill. David J. Uhle and Joseph V. Durnin, Allentown, Pa. No. 1,752,622.

Pulverizing or grinding mill. David J. Uhle and Joseph V. Durnin, Allentown, Pa. No. 1,752,623.

Rotary pivoted hammer. John P. Polster, Alton, Ill., assignor to Illinois Stoker Co., same place. No. 1,-753,475.

Screening

Screening machine (grizzly type). Arthur D. Vickerman, Pueblo, Colo. No. 1,753,630.

Screen structure. Samuel B. Stine, Osceola Mills, Pa. No. 1,753,355.

FOREIGN

Cement

Method for production of cement. G. Imai. British 319,342.

Hydraulic cement. The Brown Co. Canadian 298,820.

Kiln for production of cements, particularly of aluminous cements, clinkerized or fused. Societe Anonyme des Chaux et Ciments de Lafarge et du Teil and Societe d'Electro-Chimie d'Electro-Metallurgie et des Acieries Electriques d'Ugine. French 683,037.

Excavators

Mining machines. Sullivan Machinery Co. British 299,769.

Excavating apparatus. H. Wade (J. W. Page). British 326,648.

Gypsum

Method of reducing gypsum. Baron Marks (Polysius Akt.-Ges.). British 326,612.

Gypsum-reinforced building material. Canada Gypsum & Alabastine Ltd. Canadian 298,823.

Kilns and Firing Methods

Apparatus for pulverized coal firing. L. & C. Steinmueller. German 496,042.

Pyrometer. Siemens & Halske Akt.-Ges. German 495,906.

Apparatus for straw firing of annular or chamber kilns. Michael Bohn. German 495,859.

Closing shutters for tunnel kilns. Eesti Patendi Aktsiaselts. British 304,238.

Apparatus for charging kilns or furnaces. P. J. Beswick. British 326,613.

Tunnel kiln. Arthur McDougall Duckham. Canadian 298,760.

Method and apparatus for burning finely divided fuel. The Peabody Engineering Corp. Canadian 298,923.

PIT AND QUARRY will furnish, at its actual cost, a copy of any patent cited above. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.

Material-Handling

Drive for conveyors. Amme-Luther Werke Braunschweig der Miag Muehlenbau und Industrie A. G. German 496,150 and 496,210.

Apparatus for transferring bulk materials from railroad cars to ships. Pohlig Akt.-Ges. German 496,151.

Feeding devices for powdery or granular materials. Baron Marks.

Rollerway conveyor. Societe Ardoisiere de l'Anjou. British 309,026.

Fabric for conveyor belts. E. von Asten. British 326,699.

Conveyor chain. Hans Renold, Ltd. Canadian 298,927.

Gravity conveyors. Societe Anonyme Compagnie des Transporteurs Simplex and A. Fouchy. French 683,036.

Elevating Mechanism. Societe Amstutz, Levin & Cie, S. A. French 683,087 and 683,283.

New Corporations

General Quarry Co., Austin, Tex. M. H. Goldsmith, 507 Oakland St., Austin; H. J. Wilson, 227 Rosemary Ave., San Antonio; G. J. Ditmar, Austin. $25,000.

Magnolia Lime Products Co., Brandon, Miss. J. B. Reid, Brandon, Miss.; W. C. Batson, Wiggins, Miss.; W. H. Morris, Hattiesburg, Miss. $5,000. To quarry agstone and manufacture lime rock products.

Washtenaw Rock Products Co., Manchester, Mich. C. C. Alfred, Mgr. $40,000.

Bushnell Basin Sand & Gravel Corp., 60 Scio St., Rochester, N. Y. Louis P. Iuppa, Pres.; Charles Battle, Sec.-Treas. Plant at Bushnell Basin, Pittsford P. O., Monroe County, N. Y.

Cumberland Stone Co., Inc., Crab Orchard, Tenn. $50,000.

Maugus Sand & Gravel Co., Inc., Wellesley, Mass. Samuel Halperin, Wellesley, Mass.; Richard L. Bennett, Natick, Mass. $100,000.

Bridgeton Wash Gravel Corp., Bridgeton, N. J. Leroy W. Loder, R. Winfield Hunt, Feinstein Bldg.; Franklin J. Lore. To produce washed sand and gravel and manufacture blocks, curbing and other sand and gravel products.

Key Largo Quarries, Inc., 960 N. W. 4th St., Miami, Fla. G. B. Wilson, Pres.; J. C. Whippo, Sec.-Treas.; C. R. Pierce, V. Pres. 500 shares. To produce granite and sandstone.

Cashion Slag Co., Butler County Nat. Bank Bldg., Butler, Pa. Joseph E. Cashion, Pres.; R. B. Fleming. To produce crushed slag, crushed stone, sand.

Silver Lane Sand Co., Silver Lane, Conn. Harry L. Keeney, Pres., 100 Silver Lane, Silver Lane, Conn. (Previously reported at East Hartford, Conn.) $50,000.

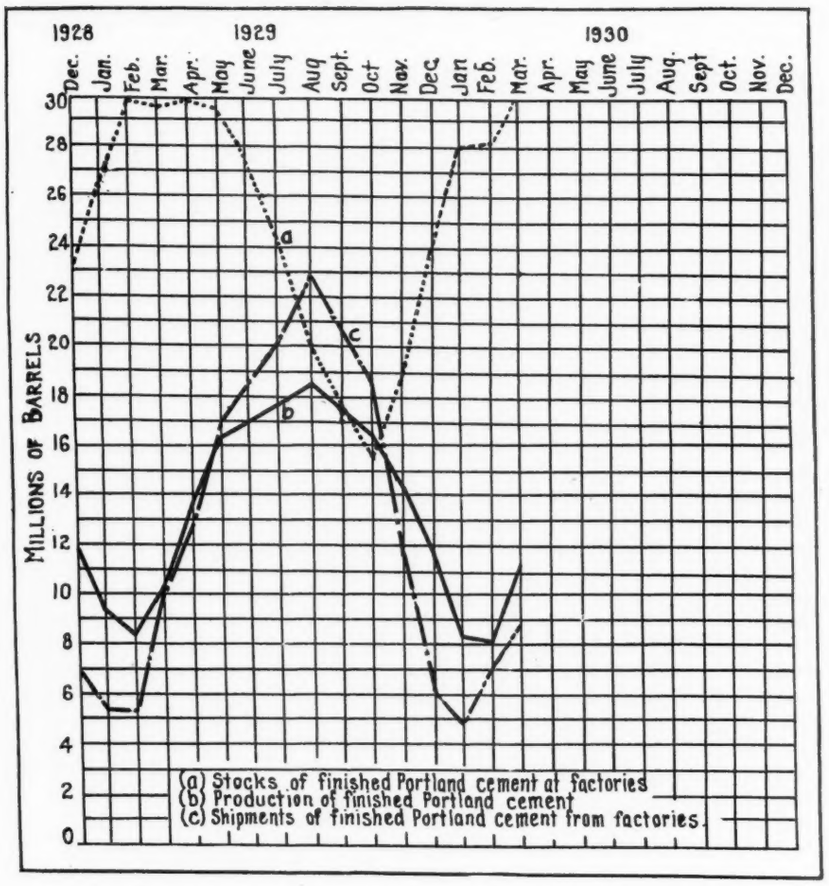

1928
1929
1930
Dec. Jan. Feb. Mar. Apr. May June July Aug Sept. Oct Nov. Dec. Jan Feb. Mar. Apr. May June July Aug. Sept Oct. Nov. Dec.
MILLIONS OF BARRELS
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
a
b
c
(a) Stocks of finished Portland cement at factories
(b) Production of finished Portland cement
(c) Shipments of finished Portland cement from factories.

Chart showing production, shipments, and stocks on hand of finished portland cement, by months—December, 1928, to March, 1930.

Cement Production in March Shows Increase

American portland cement mills show some improvement during the past month in the ratio of operations to capacity as indicated by the figures for 12 months' period ending March 31. According to statistics released today by the Bureau of Mines of the Department of Commerce the ratio of operations to capacity for the last 12 months' period was 66.1 per cent. This ratio for the 12 months' period ending February 28 was 65.6 per cent. However, the ratio percentage for the 12 months' period ending March 31, 1929 was 70.9 per cent.

During the month 11,225,000 barrels were produced, 8,846,000 barrels were shipped, and stocks on hand at the end of the month were 30,563,000 barrels. Production in March 1930 was 12.6 per cent more and shipments 12.5 per cent less than March, 1929. Stocks at the mills were 2.8 per cent more than a year ago.

Outlines Safe Practices Publicity in Pamphlet

Safety advertising within industry is generally regarded as one of the most practical accident prevention measures, since it provides a medium whereby management may address supervisors and workmen repeatedly concerning the need for safe practices. No safety campaign can be entirely successful without cooperation from "the man on the job."

As the sixth in a series of industrial safety leaflets designed to present the principles governing successful accident prevention work and to describe effective methods of applying them, the Policyholders Service Bureau of the Metropolitan Life Insurance Co. has just issued a publication entitled *Safety Advertising*. This is based on a study of the field of safety engineering and outlines current methods of preparing and displaying safety advertising material as a means of keeping employees constantly informed of the importance of safe workmanship.

The publication discusses the principles, form, appeal and media to be used in this type of publicity and is illustrated with photographs of effective bulletin board and blackboard displays. Industrial executives and others interested in this subject may secure copies of "Safety Advertising" by addressing the Bureau at 1 Madison Ave., New York, N. Y.

Coming Events

May 12, 1930. Cleveland, O. Meeting, Steel Founders' Society of America. G. P. Rogers, managing director, 932 Graybar Bldg., New York, N. Y.

May 15, 1930. Washington, D. C. Annual meeting, American Road Builders' Assn., at 914 National Press Bldg. Chas. M. Upham, engineer-director, same address.

May 19-20, 1930. White Sulphur Springs, W. Va. Annual meeting, American Refractories Institute. Dorothy Texter, secretary, Oliver Bldg., Pittsburgh, Pa.

May 29, 1930. Easton, Pa. Portland Cement Association regional safety meeting, at Hotel Easton. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

June 3-4, 1930. Chicago, Ill. National Lime Association annual convention at Edgewater Beach Hotel. W. V. Brumbaugh, assistant secretary, 927 Fifteenth St., Washington, D. C.

June 9-12, 1930. Colorado Springs, Colo. Sixth annual convention, National Fertilizer Association at Broadmoor Hotel. Charles J. Brand, secretary, 616 Investment Bldg., Washington, D. C.

June 16-25, 1930. Berlin, Germany. World Power Conference. World Power Conference Program Committee, Room 818, 29 W. 39th St., New York, N. Y.

June 23-27, 1930. Atlantic City, N. J. Annual Meeting, American Society for Testing Materials.

June 24, 1930. Cleveland, O. Portland Cement Association regional safety meeting, at Hotel Cleveland. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

June 26, 1930. Washington, D. C. Portland Cement Association regional safety meeting, at Hotel Raleigh. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

July 1, 1930. Detroit, Mich. Portland Cement Association regional safety meeting, at Book-Cadillac Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 9, 1930. Seattle, Wash. Portland Cement Association regional safety meeting, at New Washington Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 16, 1930. San Francisco, Cal. Portland Cement Association regional safety meeting, at St. Francis Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Calaveras Cement Earns $2.84 per Share in 1929

The Calaveras Cement Co., with plants in Calaveras County, California, reported net income of $506,905 for the year ended December 31, 1929. This was equivalent to $2.84 a common share, compared with $636,361, or $3.90 a common share in 1928.

The balance sheet as of December 31, 1929, disclosed a strong cash position, cash and call loans of $717,600, alone being more than three times current liabilities of $204,214. Total current assets were $1,383,875. The balance sheet also indicated a total book value of $791,606, applicable to the 125,078 no-par common shares or $6.33 per share, compared with $4.83 per share based on 123,830 shares on March 31, 1929.

A. B. Shelby, vice-president and general manager of the company, said in the report for 1929 that results for the year were quite gratifying, even though building construction, involving the use of cement, was less than in either 1927 or 1928. While the company's selling prices were firm during the early months of the year, reductions were experienced during the latter part which affected net profit to some extent. Mr. Shelby stated that the outlook for 1930 was encouraging.

Report Johns-Manville May Acquire Raybestos

There have been some discussions looking to the acquisition of Raybestos-Manhattan, Inc., by the Johns-Manville Corp. The absorption of Raybestos-Manhattan would further round out Johns-Manville's line, giving it an important producer of general asbestos and rubber products.

In the year 1929 Raybestos' sales totaled $22,290,619 as compared with sales by Johns-Manville of $61,994,884, a combined total of $84,285,503.

The acquisition of Raybestos would be in line with the policy of Johns-Manville in building up its business by purchasing established concerns. Last year four properties were taken over—Banner Rock Products Co., Weaver-Henry Manufacturing Co., Preformed Asphalt Products Co., and E. N. Biegler Manufacturing Co. These additions, together with its own growing business, had the effect of increasing the company's sales by $14,049,325 or close to 30 per cent. Approximately 21 per rent of the gain represented sales by the newly adquired companies.

During 1929 Rayestos reported net profit available for dividends of $3,206,294, equivalent to $4.74 a share on 676,012 capital shares. In the previous year the present constituent companies showed a combined net of $2,465,586 or $3.64 on the present stock. Raybestos-Manhattan is a combination of the Raybestos Co., United States Asbestos Co. and Manhattan Rubber Manufacturing Co. consolidated last year.

Net profit of Johns-Manville, after charges and taxes in 1929 totaled $6,591,916 equivalent to $8.08 a common share, after preferred dividends. In 1928 net equaled $5,589,398 or $6.75 a share.

At the close of 1929 total assets of Johns-Manville totaled $43,938,051, compared with $19,453,590 for Raybestos. Current assets of Johns-Manville were $17,080,573, while those of Raybestos amounted to $9,962,608.

Cash of Manville totaled $2,724,293 and of Raybestos, including call loans and marketable securities, $3,471,795. Inventories of Raybestos of $4,758,906 compared with $6,597,309 for Manville.

Working capital of Manville amounted to $11,789,944 and of Raybestos to $8,819,409.

Authorized capitalization of Johns-Manville consists of 100,000 shares of 7-per cent cumulative preferred and 1,000,000 no-par common shares. Of the preferred 75,000 shares are outstanding and of the common 750,000 shares.

Raybestos had an authorized issue of 1,000,000 shares of capital stock, of which 676,012 are outstanding.

Largest English Cement Producer is Prosperous

Associated Portland Cement Manufacturers, Ltd., one of the largest Portland-cement manufacturers in England through direct operations and holdings in other companies and operating in South Africa and British Columbia, reported for 1929 net earnings of £367,515, equal to 77 cents per preference and 39 cents per ordinary shares, after interest and £105,333 debenture sinking fund, compared with £366,379, equal to 77 and 39 cents per preference and ordinary shares (respectively), after interest and £98,530 debenture sinking fund in 1928. American depositary receipts have been issued against registered ordinary shares of the company in the ratio of one receipt for each share deposited. Dividends on the preference stock have been paid regularly, and dividends at the rate of 8 per cent have been distributed on the ordinary shares in the last three years. On the American depositary shares initial dividend equal to 8 per cent less depositary fees was paid on March 31, 1929, and on April 1, 1930, an equal dividend was also paid.

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE	COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
American Brick Co.	Preferred	$.50 qr.	April 25	May 1	Pacific Clay Products		$.60 qr.	April 20	May 1
Bessemer Limestone & Cement	Class A	$.75 qr.	April 20	May 1	Pennsylvania Salt	Common	$1.25 qr.	Mar. 30	April 15
Calaveras Cement Co.	7% Pfd.	1¾% qr.	Mar. 30	April 15	Riverside Cement	1st Pfd.	$1.50 qr.	April 15	May 1
Consolidated Sand and Gravel	Preferred	1¾% qr.	April 31	May 15	Riverside Cement	Class A	$.31¼ qr.	April 15	May 1
Construction Materials	Preferred	$.87½ qr.	April 19	May 1	Raymond Concrete Pile	Preferred	$.75 qr.	April 20	May 1
General Refractories	Common	$.75 qr.	May 12	May 26	Raymond Concrete Pile	Common	$1.00 qr.	April 20	May 1
Illinois Brick		$.60 qr.	April 1	April 15	Standard Paving & Materials, Ltd.	Preferred	1¾% qr.	May 2	May 15
Johns-Manville	Common	$.75 qr.	Mar. 25	April 15	Standard Paving & Materials, Ltd.	Common	$.50 qr.	May 2	May 15
Kentucky Consolidated Stone	Preferred	1¾% qr.	April 15	May 1	Superior Portland Cement	Class A	.$27½M	April 23	May 1
Lehigh Portland Cement	Common	$.62½ qr.	April 14	May 1	Warner Co.	Common	$.50 qr.	Mar. 30	April 15
Missouri Portland Cement		$.50 qr.	April 19	May 1	Wolverine Portland Cement		$.15 qr.	May 5	May 15
New York Trap Rock	Preferred	$1.75 qr.	Mar. 20	April 2	Worcester Salt Co.	Preferred	1½% qr.	May 10	May 15

Legal Information for Operators

Guarantor is Liable for Payment of Obligations

Generally speaking, a material man who supplies building material to a contractor, when relying upon a promise on the part of the owner to pay, is entitled to a mechanic's lien. Also, it is important to know that a promise to *stand responsible* or guarantee payment of another person's account is a surety's obligation which must be in writing or it is not an enforceable and valid obligation. However, a verbal agreement to pay another person's bill is a positive obligation on the part of the guarantor and therefore it is enforceable. In the former instance the guarantor guarantees payment if the debtor fails to pay and in the latter the guarantor is the primary debtor.

For illustration, in Harper Co. v. Teate, 125 So. 21, it was disclosed that a material man furnished building material to a contractor relying upon the owner's verbal promise to pay the amount of the bill. The contractor failed to pay the account and the material man filed a mechanic's lien. The owner attempted to invalidate the lien and contended that he was in fact the contractor's surety. However, since the owner positively guaranteed to pay the bill and thus assumed a positive obligation, the Court held the owner personally liable for payment, stating the following important law:

"If a material man, upon the request or by the authority of the owner, furnishes material to a contractor in reliance upon the promise of the owner, express or implied, to pay for it, credit being extended to the owner, so that the owner becomes a primary debtor and not a mere surety, the material man . . . is entitled to a lien for the full amount of the debt, notwithstanding he gave no notice to the owner."

Projections from Truck Striking a Pedestrian

Ordinarily, the owner of a motor truck is not liable in damages for injuries inflicted on pedestrians, unless the injuries resulted from negligence of the driver. For instance, it has been held that a pedestrian who carelessly fails to look up and down a street before crossing is not entitled to damages for an injury caused by a motor vehicle, particularly if the driver exercised ordinary care to prevent the accident.

On the other hand, the law is well established that motor-truck owners are liable in all instances where an injury is effected by a part of the truck which projects outwardly from its side, or by an object which is negligently permitted by the driver to extend beyond the side of the vehicle.

For example, in Boyle v. Leech, 148 Atl. 70, it was disclosed that a motor truck used to haul rock was constructed with supporting struts which extended two feet beyond the sides of the body of the vehicle. One of these struts struck and seriously injured a pedestrian who sued the owner to recover damages for the injury. The owner of the vehicle attempted to avoid liability on the contention that the driver had placed a warning signal, consisting of a large piece of red cardboard, on the strut. However, the Court held the truck owner liable, stating important law as follows:

"Driving a truck through the public streets loaded as the one here in question was, with a projection extending into the sweep of oncoming travel, was a most negligent performance, disregardful of the rights of other users of the highway. The operator of the truck was bound to foresee just such a situation as here presented itself, that the drivers of other motor vehicles coming in the opposite direction might not quickly enough realize that there was something, dangerous to them, extending beyond the line of the truck and into their lane of travel, and be unable to avoid it. Whosoever adds to the dangers of public travel by such an act must take all the consequences of his disregard of others' rights. . . . Where one uses a motor vehicle on the highway . . . with any projection extending beyond the lines of the car, he will be presumed to apprehend any danger that may come from the . . . projection, and will be responsible for any injury occasioned thereby."

Municipality Held Not Liable for Pit Injury

While a common or private employer usually is liable for injuries sustained by his employees, it is interesting to observe that the higher courts have upheld the view that a municipality is not liable for injuries sustained by its employees who are injured while performing a governmental function.

For instance, in Luebken v. City of Hanover, 283 Pac. 501, a municipal employee, hired to haul sand and gravel, was injured when a gravel bank caved in. He sued the city for damages.

The testmony disclosed that the city rented a small tract of ground for a gravel pit about a mile and a half away. It employed workmen to remove the top layer of earth so as to uncover the sand and gravel. Then it offered work to all who chose to haul from the quarry. The pay was $1.00 for 4,200 lb., the workmen furnishing their own motor trucks.

It is interesting to observe that the higher Court held the city not liable and explained the law on this subject as follows:

"In the matter of renting a quarry and hiring teamsters to haul sand and gravel therefrom to spread on the public streets, the city was engaged in a governmental undertaking—discharging a function of a public character, in contradistinction with some city projects and activities which are said to be of a proprietary or quasi private corporate character. . . . In the absence of a statute imposing liability on a city for the negligent discharge of its governmental functions, the municipality cannot be mulcted in damages."

Liability on Contracts By an Illegal Officer

A *de facto* officer is one who has the reputation and position of the officer he assumes himself to be, and yet is not entitled to the office in point of law. Also, a *de jure* officer may be one who has the lawful right to the office, but who has either been ousted from it or has never actually taken possession of it. In general, the contracts of all officers *de facto*, acting within the sphere of their office, are binding upon the corporation. In other words, although a *de facto* officer is not a legal officer and he may be ousted by legal procedure, yet the corporation is liable for all contracts he makes while acting in his usual capacity.

For example, in Consumers' Salt Co. v. Riggins, 282 Pac. 954, it was shown that a man named Mullholand was elected secretary of a salt corporation by the directors who were *not* legally qualified to elect a secretary. Certain stockholders filed suit to oust Mullholand and endeavored to relieve the corporation of liability for his contracts. The Court ousted Mullholand, but held the corporation liable for contracts made by him, stating important law as follows:

"Even if we assume that their election as directors was illegal, and therefore they were not *de jure* directors, they were, nevertheless, under the facts just stated, *de facto* directors of said corporation, and as such their acts were binding upon the corporation in all respects as if they were the *de jure* directors thereof."

Insurance Problems Discussed

When Income Burns Up

An insurance agency has just finished adjusting a fire loss that "never could happen." The insurance in question covered the contents of a one-story brick manufacturing building. The machinery and stock were entirely incombustible and the only thing which could burn was the roof boards. The president of the concern had often said that he was thinking of dropping his insurance because he did not see how the roof could ever catch fire and, if it did, it would not damage the property much. Yet the roof did catch fire, and after it had fallen, $50,000 worth of machinery and stock was worth less than $2,000 as salvage.

But that was not all. After the fire engines had gone away the owners started to work feverishly to get back into business. With all their efforts, however, it took them two weeks to find a satisfactory location for a new building and another week to make their plans. Now it will probably take them between two and three months to build a new building and install new machinery. During all this time they are paying office rent, taxes, wages of two clerks, two foremen and six old employees whom they did not want to lose, although there is no income coming in. And, worst of all, some of their customers are going over to rival concerns to get their orders filled.

Two Kinds of Loss

The unfortunate predicament of this firm points to the fact that there are two kinds of fire insurance. The kind with which we are all familiar reimburses a property owner for the value of buildings, machinery, and other property damaged by fire, and gives him the money with which to replace his plant. The other kind, which is just as real even though it is intangible, indemnifies the insured for the loss of earning power during the months necessary to get back in business after a fire. This is called "business-interruption" or "use-and-occupancy" insurance.

The clearest illustration of the difference between these two forms of loss was an experience that the writer witnessed about two years ago. Fire destroyed a printing plant. "Yes," the owner told everyone who sympathized with him, "we were fully covered by insurance." So he was, in a way. He collected $43,000 from the insurance companies, which was enough to cover his loss of machinery and permit him to buy new equipment. But after the fire he ran into some unavoidable delays in getting back to production, and five months slipped by before he was ready for business. Almost immediately thereafter he went into bankruptcy. Now why did he fail? Well, somebody had to pay the overhead of those five months. He could have succeeded if he had had a cash surplus big enough to carry his pay roll and rent for this term or if he had had business-interruption insurance. But without either of these he failed, even though his ordinary fire insurance was adequate for its purposes.

These practical experiences are typical of what is happening every day in the business world. When you order fire insurance, don't just call up your agent and tell him to "write you up for another $10,000," or something vague like that. Make your agent go over the whole situation with you and show you what kind of policy you really should have. The loss of earning power is always important. And there are some cases in our associated industries where the loss of income is more serious than the physical destruction of the property. Take, for example, a producer operating in a simple frame building with comparatively little machinery. If fire destroyed this plant the loss of property might not be much, but the interruption of business might easily cost a year's profits and might even put the firm out of business. I have actually seen plants where the owner is carrying full property insurance on a small value and where, if he studied out the situation thoroughly, he would see that it would be better for him to carry insurance on his income even if he had to drop his ordinary insurance to do so.

What Is Covered

This so-called business-interruption fire insurance covers the property owner against the loss of net income during the period necessary to rebuild and get back into business following a fire. We say "net" income because some of the regular operating expenses can be eliminated during this period and it is not necessary to pay for insurance on something that is not a real loss. For instance, the cost of raw materials would stop because this expense will not be incurred until the wheels are turning again. In the same way, the pay roll for ordinary labor will be cut off, as will most of the cost of power, heat and light. To be exact, then, we may say that this insurance covers the property owner against loss of his gross income minus such operating expenses as could be stopped during a suspension of business.

Profit Plus Overhead

If you will turn this definition around backward, it is easy to see just how big your loss of income might be. For you will get the same result if you say that this insurance covers the net profits plus the overhead expense that would continue while the plant is shut down. The factors which make up this loss include the following:

Net profits
Taxes
Salaries of executives
Wages of foremen and valuable employees
Liability insurance premiums
Advertising
Rent
Interest on loans and bonds.

If your firm has a large cash surplus, you can live through the reconstruction out of your surplus. But, otherwise, business interruption insurance offers the best practical way to keep your business from going into bankruptcy after a fire.

In the paragraphs above we have spoken of business interruption insurance only in connection with the risk of fire. That is because fire is the most universal risk and the one that is most widely insured against. However, the same principle holds in the case of other casualties. A property owner may buy this income protection against loss from windstorm, explosion, bombing, earthquake, flood or any other hazard. The basic form is the same in all cases, although the rate naturally varies according to the severity of the individual risk.

Seasonal Business

Business-interruption insurance is more important to the people in our associated industries than in the average of all industries over the country. That is because many of us have only one operating season each year. If a retail store should be burned out and need six months to get back into business, it would still earn half a year's profit. But if a producer of construction materials should have his work stopped by fire in March or April, he might lose a whole year's business. The seasonal aspect of the business means that we are almost as much interested in the time that fire might come as we are in the possibility of fire itself. At the beginning and peak of our production season we are peculiarly susceptible to being put out of business by fire, and business-interruption insurance seems to have been designed with special regard for industries such as are covered by PIT AND QUARRY.

In our next issue we shall give some suggestions concerning the best rates and policy forms for this insurance.

Review of Foreign Practice

Three Processes for Manufacturing Alumina

I. Na_2O, Al_2O_3 is formed by fusing Al_2O_3 and Na_2CO_3 at 500-1,050 degrees. The presence of NaCl has no appreciable effect on the reaction. The reaction rate increases with the increase in the amount of Na_2CO_3 present, but is also dependent on the nature of the raw material. For bauxites fusion with Na_2CO_3 for 2 hours at 980 degrees is recommended. Quick leaching with water leaves ¼ of the Al_2O_3 in an insoluble form. Addition of Na_2CO_3 to this water is of no benefit, but addition of NaOH (1/3 of the amount present in the melt) increases the yield of Al_2O_3 by almost 100%. Molecule ratio of Na_2O to Al_2O_3 in the solution is about 1.09–1.48 which is not in accordance with the Goudrian diagram.

II. Bauxite aluminates are formed at higher temperatures than those of Na. Fusion at 1,220 degrees with $BaCO_3$ converts 88–98% of Al_2O_3 into water-soluble form, while at 1,000 degrees not over 55% Al_2O_3 can be extended. In the presence of fluxes such as NaCl about 93% Al_2O_3 is converted into the water-soluble form at 1,000 degrees. Solubility isotherms of the system BaO–Al_2O_3–H_2O were investigated at 60 degrees. Maximum solubility corresponds to 3.48% BaO and 1.129% Al_2O_3 by weight (Al_2O_3: $2BaCO_3$). No compounds are formed. Solubility isotherms of the system $Ba(OH)_2$–NaCl–H_2O at 60 degrees show that no compounds are formed and that the highest solubility corresponds to a mixture of 1.17 molecules of BaO and 1 molecule of NaCl (the ratio may be even closer to one). NaCl increases solubility of $Ba(OH)_2$ by 1.52% only. Investigation of the system BaO–Al_2O_3–NaCl–H_2O at 60 degrees showed that presence of NaCl has no effect on solubility. By fusing bauxites with Na_2CO_3 more Al_2O_3 is converted into a soluble form than by fusing with $BaCO_3$, but the Ba process yields a product with a low SiO_2 content as compared with the Na_2CO_3 process.

III. In fusing Al silicates with Na_2CO_3, the principal compounds formed are $Na_2O.Al_2O_3$ and 1-1.5 $Na_2O.Al_2O_3.2$-2.5 SiO_2. Not more than 1 molecule of Na_2CO_3 should be present per molecule of Al_2O_3 and per 2 molecules of SiO_2; otherwise considerable SiO_2 is obtained in water-soluble form. The residue insoluble in water has an approximate composition $Na_2O.Al_2O_3.2SiO_2$. Best fusing temperature is 850–950 degrees. When nepheline ($Na_2O.Al_2O_3.2SiO_2$) was fused with CaO and the melt leached with water the insoluble residue contained all four oxides. The Al_2O_3 and Na_2O content of this residue decreases with the increase in the amounts of CaO and SiO_2 present. When clay (SiO_2 44.25, Al_2O_3 38.73, Fe_2O_3 0.85, TiO_2 1.62, H_2O 14.44%) was fused with Na_2CO_3 and $CaCO_3$ more water-soluble Na_2O and Al_2O_3 were formed than with nepheline. The insoluble residue probably contains $3CaO.SiO_2$. By leaching the melt with hot NaOH solution more Al_2O_3 is extended but SiO_2 is also partly dissolved. The solution of the problem consists in finding conditions under which all of Al_2O_3 and no SiO_2 are extended, but this could not be accomplished.—G. G. Urazov, Y. E. Vilnyanskii, A. V. Chitaev, Y. E. Morachevskii. (*Prikladnoi Khim*, 1, 1928. C. A.)

Cement Production and Trade in Switzerland

Switzerland has a Federal Commission for the Investigation of Prices (*Commission federale d'etude des prix*), which until recently had published studies concerning the establishment of prices only on principal food commodities. More recently it has turned its attention to industrial materials, and according to *Revue des Materiaux de Construction* (Paris, Oct., 1929) has published a fully documented report on the production and commerce in cement in Switzerland.

The first part of this work gives a brief summary of the Swiss cement industry and the process of manufacture, and discussions of such questions as the influence of the degree of activity of a plant on the costs of production, exportation and importation, organization of the industry (cartel), etc. The second part is devoted to the problems of the price movements, freight rates, and the conventional rate of prices.

Italian Experiments on Concrete Railway Ties

One of the most notable tests on concrete ties for railroads was the experiment of the Italian railroads, which between 1906 and 1908 put 300,000 ties of reinforced concrete into use. Influenced by this step, the Hungarian railroad in 1911 put into service in 1911 4,000 ties of two types developed during the Italian investigations, and observations on these ties were in progress when the war broke out. The war gave a great stimulus to the investigation of reinforced concrete ties because wooden ties were hard to get and prohibitive in cost. In an attempt to improve upon the ties of the Italian type the officials of the Hungarian road, following theoretical calculations, designed a tie of reinforced concrete of trapezoidal section, 260 cm. long, 16 cm. high in the middle and 13 cm. at the ends, 22 cm. wide at the upper surface and 24 cm. wide at the broadest point, and designed to carry a 16-ton axle load. A long series of laboratory tests indicated that these ties at 90 days gave bending strengths 80 per cent to 120 per cent greater than the best of the Italian style ties, and 40 per cent greater resistance to shear, although the Italian ties used in the comparative tests were 5½ years old. Between 1921 and 1925 the Hungarian state railways put about 100,000 ties of the new type into service, and at the end of 1927, after 6½ years, only 27 out of the original 100,000 were unfit for further service. In the construction of these ties the railroad specifies cement yielding 450 kg/cm² in compressive strength and 32 kg/cm² in tensile strength (6,600 lb./sq. in. and 469 lb./sq. in respectively) in the standard tests; the concrete mix must contain at least 400 kg. of cement per cubic meter of concrete (669 lb. per cu. yd.); the concrete must yield 240 kg/cm² at 28 days in the dry mix and 220 kg/cm² in the plastic mix (3,520 and 3,095 lb./sq. in., respectively), and both must yield 275 kg/cm² (4,033 lb./sq. in) at 90 days. The most suitable aggregate has been found to be river sand and river gravel, rather than crusher sand and crushed stone. The maximum size of gravel used is 15 mm. (0.6 in.) and the ratio of minus 3-mm. material to plus 3-mm. material (3 mm. being approximately ⅛ in.) must be not less than 0.4:1 nor more than 0.6:1.—Geza Mendl in *Organ f. die Fortschritte des Eisenbahnwesens* (Munich) 84:386-391, Sept. 20, 1929.

Review Chemical Steps in Cement Manufacture

The tests of H. Lorenz have shown that: (1) When the cement slip is heated almost half, the lime forms new compounds with the clayey constituents during the interval that the carbon dioxide is eliminated; (2) Clinker formation consists in the transformation of substances poor in lime to others richer in this material; (3) the formation of bicalcium silicate takes place between 1,800 and 2,200 deg. F.; (4) Clinkerization at 2,300 deg. F. causes the lime to undergo a rapid reaction in which the calcium silicates and aluminates are transformed into clinker, of which alite

and celite are the principal constituents; (5) the amount of lime which reacts with the clay between 2,300 and 2,650 deg. F. are greater than the amount indicated if bicalcium silicate were the principal constituent of Portland cement clinker; (6) The course of the reaction is in accord with the hypothesis that alite is a mixture of tricalcium silicate and janaeckite; and (7) celite appears to be a mixture of bicalcium ferrite and $4CaO, Al_2O_3, Fe_2O_3$.—H. Kühl (Report to the Berlin Cement Institute and *Le Ciment*, November, 1929.)

Effect of Using Silica Gel in Portland Cement

The effect of substituting silica gel for a portion of the Portland cement in standard and sand-graded mortars on the expansion and loss of strength of the mortars in sulphate solutions was determined. Portland cement-silica gel-sand mortars were cured in steam at 100 deg. C. The behavior of lime-silica gel-sand mortar in solutions of sodium and magnesium sulphate was studied. It was found that the addition of silica gel to the mortar was very effective in preventing expansion and maintaining the tensile strength of the mortar in solutions of sodium and calcium sulphate. It was not so effective with magnesium sulphate. Steam cured mortars containing silica gel to the extent of 20 per cent of the cement present showed greater resistance to the action of the Na and Ca salts but less to the Mg salt than blanks without SiO_2 gel. There was very little difference in the behavior of lime-silica gel-sand mortars with or without the addition of silica gel.—Thorvaldson, Vigfusson and Wolochow (*Can. Jour. Res.*, Nov., 1929.)

Tunneling to Reach New Deposits of Limestone

In opening up a new deposit of limestone, Australian Cement, Ltd., of Geelong, Victoria, Australia, excavated the first tunnel in that country to be driven successfully with the aid of a tunneling machine. This tunnel is of horseshoe section, 14 ft. 6 in. wide and 17 ft. high, and runs from what is to be the bottom of the new quarry, at a vertical depth of 160 ft. from the surface, for a distance of 4,376 ft., rising 118 ft. at a grade of 1 in 37 to the eastern portal, situated in an open cut with 1,400 ft. of open approach, at the plant end. Work was carried out from both ends of the tunnel, the machine driving 2,705 ft. from the lower or western portal through limestone, and hand labor accounting for the balance, 1,671 ft., through clay with bands of hard, crystalline limestone, from the eastern portal. In past years the company brought its limestone from a point about a half mile further west along the deposit by means of a 3-mile aerial ropeway. This quarry is nearly worked out, and the continued gradual easterly dip of the deposit has rendered deeper workings necessary for the new quarry. On completion of the tunnel, the quarry will be opened out from below, and limestone will be transported through the tunnel to the plant by rail. The new quarry contains limestone sufficient for fifty years at the present rate of operation.

The tunneling machine employed was built by Sir William Arrol, Ltd., Glasgow, and consists of two parts—a main frame which is held rigid during the progress of the cut, and a traversing frame carrying the main motor and cutting head of 14 ft. 6 in. diameter. The best day's run with the machine was 40 ft. The horseshoe section of the tunnel was completed by Ingersoll-Rand hammer spade diggers. The tunnel lining is a concrete shell constructed with the aid of movable circular forms in 10-ft. sections, and varying in thickness from 9 to 15½ in.—W. E. Figgis, in *Chemical Engrg. & Mining Rev.* (Melbourne) 22:5-10, Oct., 1929.

Enormous Savings Can Be Effected By Waste Prevention, Says A. C. Wilby

WHEN our country was engaged in the World War, serious attention was given by all kinds of industrial projects to the elimination of waste. This tension was considerably relaxed upon the establishment of peace, although there are prominent operators who believe that the question is just as important during times of peace. The following opinions are expressed by an official of a cement company, but they apply to every sort of pit and quarry industry.

American industry is saving millions of dollars yearly through waste prevention, according to A. C. Wilby, assistant to the president, Universal Atlas Cement Co., who spoke before the National Management Congress this month in Chicago. He recited examples of savings made by salvaging and reclaiming old and broken machinery in his own company's plants. "When the spokes on a kiln trunnion roller cracked," he said, "we saved $375 by repairing them with reinforced filler pieces welded in place instead of purchasing a new roller. Welding also was used to repair the cracked gear rim and flange on a locomotive crane turntable gear, and the bedplate under the gear was then stiffened by welding on reinforcing plate. This cost $70, as against a replacement cost of approximately $1,500. By patch-welding a worn conveyor casing in the field while the conveyor was in operation, a mill shut-down was prevented.

"Another substantial saving comes from scrap sheathings which are converted into gear casings at less than $15 each."

Accident prevention is one of the effective means of preventing waste in industry, according to Mr. Wilby. "The cooperation of employees, combined with modern, mechanical safeguards, has enabled us to reduce accidents nearly 94 per cent, compared with ten years ago. Our Duluth plant has won the safety trophy three times and has a record of 785 days without a lost-time accident.

"A continuous waste-prevention campaign is maintained because spasmodic efforts, while often productive of immediate good results, do not hold steady interest and cooperation of the rank and file of employees.

"From the beginning of our campaign, thousands of employees have helped by submitting suggestions. All plants and offices have permanent waste-prevention committees which continuously study the problem. They consider suggestions and guide the efforts of our people in the elimination of waste practice. Substantial savings for the company have resulted from this campaign."

Hill Clutch Co. Reopens New York Branch Office

It is announced by The Hill Clutch Machine and Foundry Co., Cleveland, O., that the New York office of the company has been re-opened. A. L. Whiteside, the engineer in charge, has been connected with the main plant at Cleveland for several years, and has had a wide experience in power transmission problems. He has also been actively connected with the development of the new "Hill Tubular" agitator, a device applicable to liquid and semi-fluid mixtures. Mr. Whiteside's first-hand practical knowledge of transmission and agitation problems will thus be available to all in the New York district who may be interested in equipment for these purposes.

The Hill Clutch company also manufactures grey iron and semi-steel castings and special machinery.

Traffic News and Comment

Plans for Settlement of Railroad Controversies

The Chamber of Commerce of the United States Transportation and Communication Department, has just issued a booklet entitled, "Informal Settlement of Railroad Rate Controversies" which is a summary of information furnished by shippers' organizations throughout the United States, representative freight associations, and the Interstate Commerce Commission on the subject.

There are three methods for settling railroad controversies, which are outlined as follows:

1. Conference and cooperation between the shippers and the carriers directly involved in each particular controversy.
2. Informal negotiations carried on by two parties to the controversy with the aid of the Interstate Commerce Commission acting as mediator.
3. Formal litigation before the Interstate Commerce Commission or before one of the forty-seven State Railroad Commissions.

This booklet goes into great detail on these three methods of disposing of controversies and the advantages of conference and cooperation between the shipper and carrier is pointed out in that adjustments agreed upon by the interested parties can be made effective voluntarily, whereas the powers of the regulating bodies are such that they could not always order the same settlement of the controversy. Furthermore, the cooperative plan results in more speedy adjustment of disputes as the procedure before the regulating bodies requires months and years before final disposition is made, so that the conference plan, if it can be adopted in certain cases, is of advantage to the shipper and the carrier, as well as the regulating bodies who are now overburdened with the settlement of complaints of the shipper and carrier.

Relief for Commission Sought Before Congress

The Interstate Commerce Commission has asked Congress for express statutory authority for the Commission to delegate to individual Commissioners and employees of the Commission the power to perform specified duties.

For a great many years all Commissioners joined in consideration of all cases before the Commission, however, several years ago the Commission was authorized to divide its members into as many divisions (each to consist of not less than three members) as it deemed necessary. The orders, decisions and reports of a division have the same effect as those issued by the Commission.

While this has greatly relieved the Commissioners and has resulted in much saving of time, the Commissioners are still overburdened, due to the vast amount of work assigned by the Interstate Commerce Act and the directions of Congress.

With a view of securing the necessary relief, the Commission in its last annual report to Congress suggested that individual Commissioners and employees of the Commission be permitted to decide cases involving certain phases of the Commissions work. The Parker bill, H.R. 11363, seeks to make the necessary changes in the act to this effect.

The bill does not contemplate any change in the present method of disposing of cases relating to rates for the future or contested finance cases involving construction, abandonment, acquisition, consolidation, valuation or issuance of securities.

Phosphate Rock

Southern Freight Association Docket 49,713 relates to proposed changes in rates on phosphate rock from the Mt. Pleasant-Centerville district to Ahnapee and Western Railway stations. In lieu of combination rates, it is proposed to establish a through rate of 72 cents per net ton on phosphate rock, crude lump or crude ground, in carloads, as described in and subject to the minimum weight prescribed in L. & N. R. R., I. C. C. A15803, from the Mt. Pleasant-Centreville district, to A. & W. R. R. stations, Casto, Wis., through Sturgeon Bay, Wis., and Kewaunee, Green Bay and Western R. R., New Franken, Luxemburg and Casco Jct., Wis.

In Southern Freight Association Docket 49,798, it is proposed to restore the handling charge of 2½ cents per 100 lb. on phosphate rock at Mobile, Ala., formerly published in item 775 of Agent Glenn's Port Charges Tariff I. C. C. A 688, in lieu of the 1½ cent charge published April 2, 1930.

Crushed Stone

A lower rate on crushed stone in proposed in Southern Freight Association Docket 49,853, from Boxley, Va., to Hopewell, Va. The present rate is $1.20 per net ton. The proposed rate is $1.05 per net ton. The proposal was made to enable competition with shippers in other points in Virginia.

Sand

The railroads have been asked by a shipper to revise rates on sand (blast, core, engine, filter, fire, furnace, foundry, glass, grinding, polishing, loam, moulding and silica) from Springfield, Pa., to various destinations in the state of Ohio.

At the present time, a rate of $1.76 per ton is in effect to a very large consuming territory. The shipper seeks to have this rate reduced to $1.40.

Among the destinations involved are Toledo, Fremont, Bellevue, Sandusky, Fostoria, Norwalk, Milan and Huron.

The subject is covered by Central Freight Association Docket 24458.

Limestone

Central Freight Association Docket 24,496 relates to a railroad proposal to revise rates on crushed or ground limestone from Mosher and Ste. Genevieve, Mo., to destinations in states east of the Illinois-Indiana state line. It is proposed to create a new line of through rates to be made 20c per ton over the rates in effect from Alton, Ill.

A shipper of agricultural lime and agricultural limestone, shipping from North Adams, Mass., asks that his rates be reduced in order to place him in line with his competitors.

New England Freight Association Docket 19,418 covers this subject. The present rates and the proposed rates to typical destinations are shown below:

To	Present Lime Rates	Present Limestone Rates	Proposed Rates on both
Fitchburg, Mass.	16c	7½c	7c
Hubbardston, Mass.	15½c	7½c	6½c
So. Ashburnham, Mass.	15½c	7½c	6½c
Westminster, Mass.	16c	7½c	6½c

An interested shipper has asked the carriers to publish additional rates on crushed stone coated with oil, tar or asphaltum, carloads, from Greenfield, O., to various points in Ohio and Michigan.

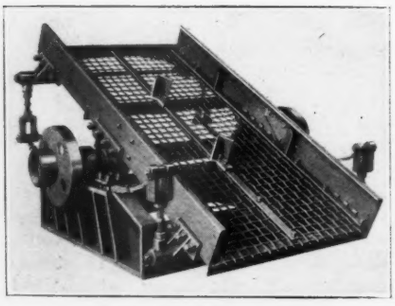
Following are typical examples of the rates sought under Central Freight Association Docket 24,454, in lieu of the present class rates:

To	Rate Sought
Lima, O.	$1.53
Springfield, O.	1.19
Bainbridge, O.	0.96
Waverly, O.	1.07
Jackson, O.	1.19
Ironton, O.	1.53
Adrian, Mich.	2.11
Detroit, Mich.	2.34

New Machinery and Supplies

Heavy-Duty Screens of New Design Developed

Developments in design and construction which are the outcome of extensive tests and over two years of use under actual operating conditions are incorporated in a line of screens recently placed on the market by Huron Industries, Inc., Alpena, Mich. These screens are particularly adapted for grading crushed stone, gravel, slag, ore, coke and other coarse materials, and on account of their sturdiness and large capacity are given the trade name of Huron



Heavy-duty vibrating screen.

"Heaviduty" screens. They can be furnished in single-deck and double-deck models, with screen frames 3 ft. by 6 ft., 4 ft. by 8 ft., or 5 ft. by 10 ft. in size, and will accommodate any type of screen cloth or plate.

According to the manufacturer, the necessary flexibility for meeting any set of operating conditions where the material graded ranges from ¼ in. to 4 in. in size is provided by these screens. The capacity depends upon the kind and size of material and its characteristics (weight per cubic foot, percentage of fines, dry, wet, sticky, washed), the rate of feed in tons per hour, the size of separation, and the kind of screen cloth used. These factors, which differ for each installation, will determine the size of screen frame, and its angle of inclination, the amount of eccentricity or "throw," and the operating speed for maximum output, which can be obtained through the adaptability of these new screens to various operating requirements.

The principle of operation is based on a positive circular-path movement which is transmitted to the screen frame so that all points on the screening surface are actuated in the same plane, the movement being perpendicular to the flow of material at the highest point of the "throw" to produce thorough screening action and resultant maximum output.

Construction is exceptionally substantial. The box-type base is made of semi-steel castings. Motion is imparted to the screen frame by a large-diameter eccentric drive shaft mounted on oversize, heavy-duty Timken roller bearings which are enclosed by annular-groove and labyrinth seals to retain the lubricant and to exclude dirt and moisture. Two flywheels with adjustable counterweights are provided to balance the rotating mechanism and prevent the transmission of vibration to the base. Special ship-channel side plates stiffen the screen frame, which is stabilized by four cantilever leaf springs equipped with adjustable shackles for changing the angle of inclination of the frame.

A pulley for flat belt or one for multiple-strand V belt can be used on either end of the drive shaft, and a bracket for mounting the motor can be attached to the base.

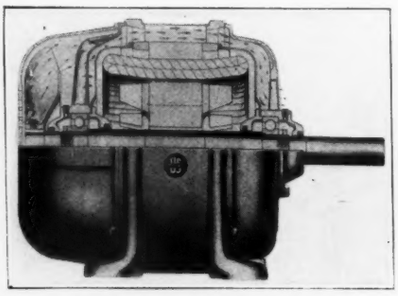
Feature One-Piece Gear Case on Universal Unit

A one-piece gear case which encloses all of the operating mechanism is a feature of the new "Unit 512" designed by the Universal Power Shovel Co., division of the Unit Corporation of America, Milwaukee, Wis. This one-piece gear case encloses all operating mechanism so that it operates in a continuous bath of oil, a design which has proved its advantage in both automobile and truck operation. This construction assures maximum wear and friction through positive lubrication, but perhaps an even greater advantage is its convenience to the operator. The business of oiling and greasing shovel mechanism has been no small task as bearings and other rotating parts were scattered all about the machine. In fact, it was a fair-sized job simply to learn where these various places were which required different forms of lubrication.

Another advantage of equal importance both to the operator and to the shovel owner are the new disk clutches. This disk clutch is so constructed that it can be adjusted at a single point without the assistance of a wrench. Ordinary clutches usually need to be replaced with only about 1/3 of the clutch surface actually gone. On the other hand, the new disk type, with its single-point adjustment, assures use of all of the clutch surface. The result is a clutch which is not only easy to adjust and to operate, but also because it is constantly in proper adjustment longer life is secured from clutch material. The facing is guaranteed to last one year.

Double-Enclosed Motors Cooled by Fan Action

In recent months a noticeable trend in the adoption of enclosed and protected electric motors has been observed, not only in the pit-and-quarry industries, but in practically every channel of manufacturing. Recognizing the need for enclosed motor construction, U. S. motor engineers have developed several types of enclosed power units in addition to the regular "open-type" motor. These are, namely, the doublenclosed type, the uniclosed type and the turbo-pump type. The Doublenclosed U. S.



A double-enclosed, ball-bearing motor.

motor was the first development offering the advantage of a totally enclosed motor, plus full cooling. It is really an enclosed motor within a protecting metal housing, the outer chamber of which is air-blasted by positive fan action. This air-blasting principle reduces the temperature so that an economical design is possible. In the smaller capacities a fan is mounted upon the shaft that protrudes through to the outer chamber. No abrasive substances can reach the rotor or windings. In the larger capacities fans are placed in the outer chamber on each side of the motor, forcing a blast of air through each end which is taken off through vents in the center of the motor.

The U. S. Electrical Manufacturing Co., Los Angeles, has issued bulletins describing these enclosed types of motors.

Swede Steel Now Made in New and Larger Factory

Paragon Steel & Tool Co. has equipped and is operating its new plant at East Rutherford, N. J. The company produces Swede Steel for drills and tools of all kinds. Rock-drill steel is made up to order for any shape of bit, hollow or solid. Joseph E. Fisher is superintendent.

Develop New Pulverizer for Small Grinding Jobs

An economical type of mill, specially developed for small grinding requirements, has been placed on the market by Raymond Bros. Impact Pulverizer Co., Chicago.

The Raymond No. 00 screen pulverizer will be found of use in any plant where a pulverized material is required in small quantities and of a uniform fineness. The unit is designed for compactness, easy cleaning and repair, and clean operation.

New Aggregate-Moisture Determination Gauge

Sand used in mixing concrete always contains more or less water in the form of surface moisture. If a mix formula calls for, say, 800 lb., and that amount of moist sand is weighed out, the amount of actual sand weighed out will depend upon the percentage of moisture. For example, let us suppose that in the draft weighed there is 1/20th moisture. Then in the draft of 800 lb. there is 760 lb. of sand and 40 lb. of water. Therefore, in order to comply with a formula which called for 800 lb. of sand, it is necessary to actually weigh out 842 lb. If the draft contains 1/20th moisture, at the same time 800 lb. of sand is added to the batch, 42 lb. of water is also added. Every concrete mix formula calls for a certain weight of water and an allowance should be made for the 42 lb. already added with the sand.

In order easily to determine the percentage of moisture in sand, the Toledo aggregate moisture determination auto-gage has been designed. This device takes advantage of the well-known fact that material loses weight when submerged in water. Two samples of the same weight of surface dry sand continue to have equal weights when submerged, but if two samples of the same weight in air, one of surface dry sand and the other of damp sand, are submerged, their weights submerged become unequal, the reason being that the water on the surface of the grains of sand in the damp sample loses all its weight and therefore the submerged damp sand sample weighs less than the originally dry sand sample. The Toledo device is so arranged that this difference in weight of the submerged samples is indicated on a chart graduated to show directly the percentage of moisture to actual sand in the damp sample. If, for example, the sample of damp sand contained 80 parts of actual sand and 20 parts of water, the index automatically indicates 25 per cent, showing that in the sample there was 25 per cent as much water as sand.

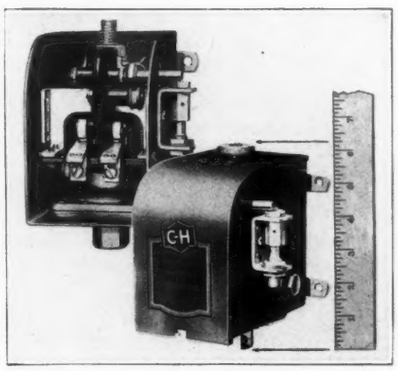
With the old method of approximately proportioning the ingredients of concrete a large factor of safety was employed to insure proper strength. This factor of safety required that more material than the maximum necessary be used, thus increasing the cost. When the different ingredients entering into a batch of concrete are mixed in exact proportions, it is possible to reduce the factor of safety with a corresponding reduction in cost. By the use of the Toledo moisture content determination device, the percentage of moisture is easily and quickly determined, and a proper correction can be made to allow for the water in the sand. Additional circles of graduations on the chart make it possible to use the device for determining specific gravity and for indicating percentages in sieve analyses.

Pressure Regulator of Small Size Announced

A new single-pole pressure regulator, exceptionally small in size, is announced by Cutler-Hammer, Inc., Milwaukee, Wis. This new device can be used as a starting switch for motors up to one horsepower, 230 volts, a.c. or d.c., or as a pilot switch in the control circuit of automatic starters for larger motors. The regulator closes the circuit at low pressure and opens the circuit at high pressure. It can be adjusted to open the circuit at any pressure from 30 to 200 pounds.

Applications range over a wide field; it can be used for maintaining pressure on systems containing water, air, gas and other similar fluids. For air compressor service, a small unloader device at the side of the case removes back pressure.

To withstand moist atmospheres, the enclosing case is black japanned and metal working parts are cadmium plated. Double-break silver contacts prevent pitting and insure good contact. The diaphragm is of rubber. Conduit knockout holes in the case facilitate wiring.

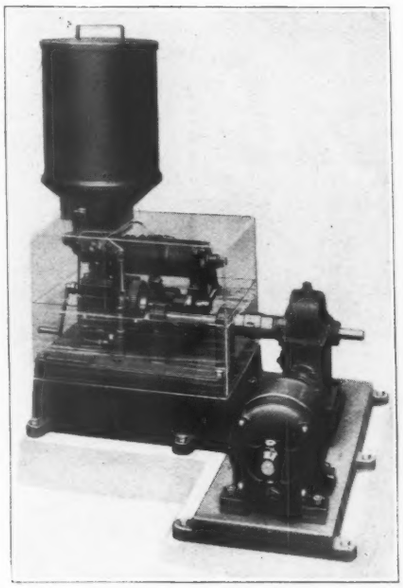


Pressure-regulating switch for starting small motors.

New Grease Pump Lifts Heaviest of Lubricants

Because the trend in present day equipment lubrication runs to heavier and more viscous materials—greases difficult to handle, but more effective when properly applied—the Hills-McCanna Co., of Chicago, announces the marketing of a new type of grease pump offering a fully mechanical means for pumping heavy mill grease.

The grease is introduced into the feeding system of the pump by means of a displacement pump operating a positive mechanical valve opened on the suction stroke, and closed prior to the discharge stroke. A distributor head with the requisite number of leads is directly connected to the discharge side of the pump. The indexing of the head is secured by means of a ratchet attachment which allows indexing on the suction stroke of the pump and remains fixed during the discharge stroke, after which it indexes to the next lead and continues in order.



Phantom view—mill-type grease pump.

Delivery lines are attached directly to the distributor head and lead to the connections of the equipment bearings. A steam heating element is installed on the bottom of the hopper casting directly above the intake valve, to facilitate handling of heavy grease during cold weather. The grease hopper has a capacity of approximately 50 lbs. Other sizes are available on order.

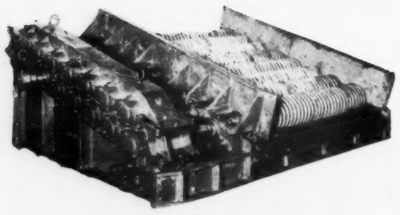
All running parts other than the motor and gear reduction unit are enclosed as a factor of safety and to protect the mechanism from dirt or scale. The entire mechanism operates in a grease or oil bath.

New Model Roll Grizzly Features Gentle Sizing

The development of the need for screening raw materials as well as products has led to a corresponding development in the design and construction of screening machinery. One type of screen that has shown great merit in screening out materials ¾-in. and larger is the live-roll grizzly screen brought out by the Fairmont Mining Machinery Co. of Fairmont, W. Va. Because of this machine's ability to withstand punishment it has been given the significant name Grizzly Bear. The severe nature of the duty to which these screens are adapted warranted the Fairmont engineers in selecting the best design and construction that they could, regardless of cost.

A series of parallel shafts, on which are strung a number of disks, are revolved in the same direction. The diameters of the disk and disk hub are so proportioned that when staggered and mounted with the shafts at their proper center-line to center-line distance apart, the required size of opening exists between the rim of each disk and the hubs of the disks with which it engages.

The shaft centers are mounted on a frame having a slope of 15 deg. to the horizontal. The material is delivered to the top rolls, receiving a



Non-clogging roll grizzly.

wave motion which facilitates the passage of the fines through the body of the material, and down through the openings. Each roll rotates slightly faster than the one behind it, spreading and thinning the material as it advances on the screen, and precluding the possibility of its receiving any grinding action in the troughs between the rolls.

One inherent advantage claimed for this screen is that the wave motion in the material is just sufficiently active to give the fines opportunity to settle through the apertures. Other advantages are that it cannot clog, it being positively self-cleaning; it feeds as it screens and can in fact be used as a feeder; it is free from sharp vibration; it is economical in space, both floor and vertical; and it is practically noiseless.

The shaft gears are of steel with cut teeth, and the drive and idler shafts are run in Hyatt roller bearings.

Young Radiator Making Oil Cooler for Boats

The Young Radiator Co., Racine, Wis., reports receipt of a large order for marine-engine oil coolers from the Lycoming Manufacturing Co., Williamsport, Pa. This order is in part for equipment to be used by the Horace Dodge Boat Co., which in turn recently placed motor specifications with Lycoming.

These devices are special cooling units developed for the particular requirements of marine engines.

First-Aid Equipment Co. Announces Name Change

Bullard-Davis, Inc. (of California) announces a change in name to E. D. Bullard Co., thus reassuming a name known to industry for over 30 years.

At the same time the company announces the purchase of the First Aid Equipment & Supply Co. of Los Angeles. This firm has been engaged in the manufacture and sale of a wide variety of first-aid material and equipment for many years.

Chain Belt Co. Appoints Representative at Macon

The Chain Belt Co. of Milwaukee, Wis., announces the appointment of the Corbin Supply Co. of Macon, Ga., as representatives for their complete line, which includes chain and power transmission equipment, conveyors and conveying systems, concrete mixers, pavers, pumps, saw rigs, plaster and mortar mixers as well as a number of allied products.

Alpha Cement Company Drilling for Petroleum

Drilling has been resumed on the test oil well on land owned by the Alpha Portland Cement Co., near Bellevue, Mich., where the company operates a cement plant. Work of drilling began last fall and a depth of 3,400 ft. was reached when operations were suspended for the winter. Repairs are now being made on the cement plant and production schedules will be resumed shortly, it is reported.

Radio Safety Series on National Chain Hook-up

The National Broadcasting Co. in cooperation with the National Safety Council has announced the third series of Universal Safety features. These programs will be broadcast over the radio chain system on Friday evenings at 6:15 central standard time, commencing April 25, 1930, when Prof. Irving Fisher of Yale University will discuss the "Economic Aspects of Health and Safety." Dr. Fisher is an eminent authority and a fine speaker. The series will run thirteen weeks, the final address being scheduled for July 18.

Two Cleveland Equipment Firms Announce Merger

The Peden Equipment Co. has been absorbed by The Day & Maddock Co., Cleveland, O., dealers in new and rebuilt machinery, and will continue to be located at the latter company's address, 8201 Almira Ave., S. W., Cleveland. The personnel of both organizations has been retained.

Los Angeles Company to Distribute for Trackson

The Trackson Co., Milwaukee, Wis., announces the appointment of the Concrete Machinery and Supply Co., 777 E. Merrill Ave., Los Angeles, Cal., as distributors of Trackson Tractor Equipment for the McCormick-Deering tractor.

Chain Maker Appoints Agent in Connecticut

The Reading Chain and Block Corp., Reading, Pa., has appointed R. G. Elliott, 631 Chapel St., New Haven, Conn., to handle its entire line in the state of Connecticut. The corporation manufactures cranes, electric and hand hoists, chain blocks and complete overhead transportation systems.

Install New Equipment at Illinois Stone Plant

The Casey Lime & Stone Co., Casey, Ill., is installing new equipment at its quarry and crushing plant near that city in preparation for resumption of operations. A force of about 20 men are to be employed. The company supplies crushed stone for road building and maintenance and for agricultural purposes.

Three New Agencies Are Announced by Link-Belt

Link-Belt Co., Chicago, Ill., announces the appointment of the following agents who will handle their complete line of crawler cranes, shovels, draglines, and locomotive cranes: P. L. Tippett, Rhodes Bldg., Atlanta, Ga.; Jos. C. Fiorello Co., Larkin Terminal Bldg., Buffalo, N. Y.; Bacon-Hibbard-Eichman, Inc., 917 Central Ave., Cleveland, Ohio.

Reclaim Cement from Storage Silos by New Method Employing Tunnel-Scraper System

A NEW system for reclaiming cement from storage silos has been developed by the Leathem D. Smith Dock Co. This system uses the patented Leathem D. Smith tunnel scraper system, which has been used so successfully in self-unloading boats, and is intended to be built into new silos to secure the maximum of its advantages.

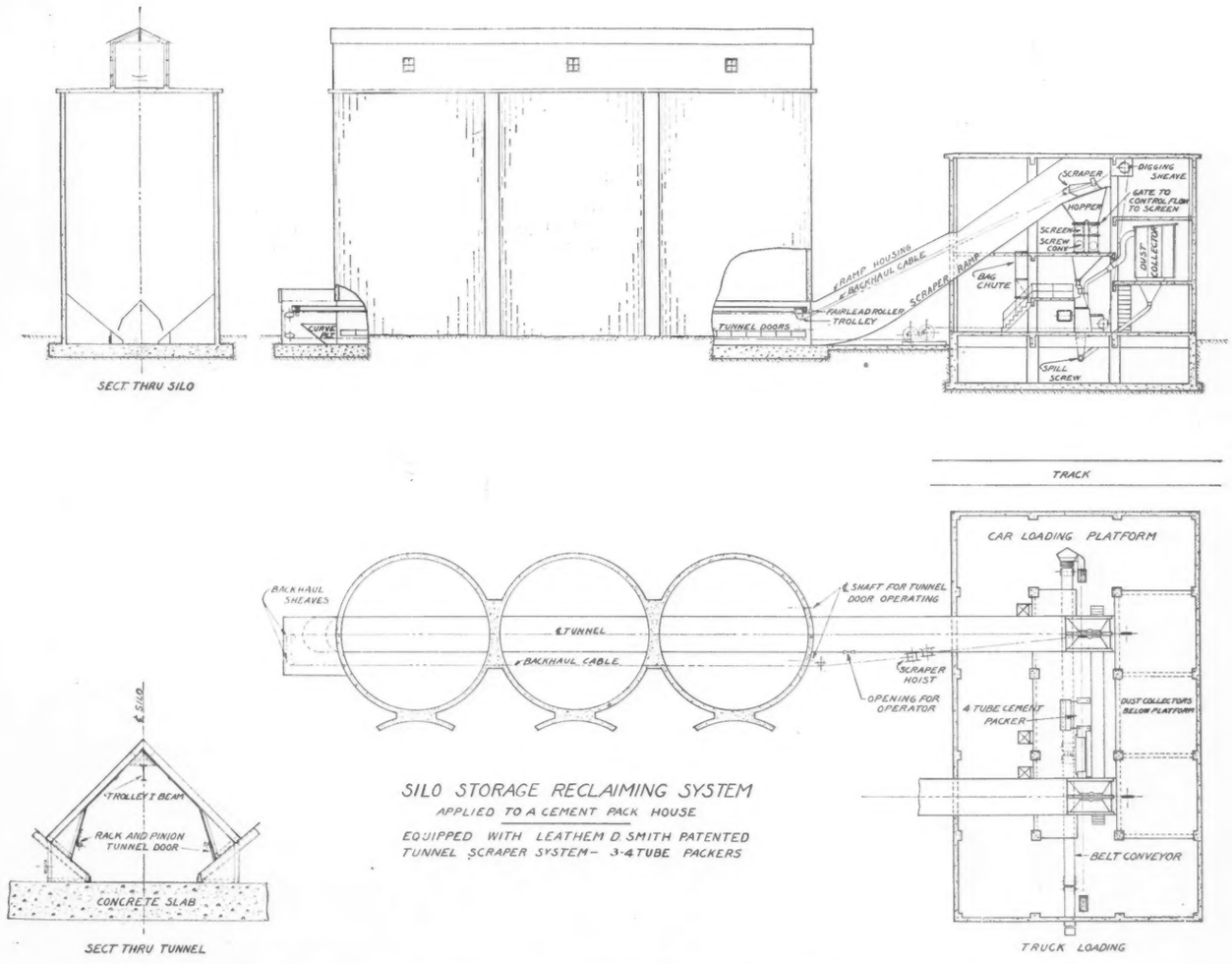
This method necessitates the construction of silos differing from the customary type in a few details. In place of the usual double floor slab there is a foundation slab and sloping sides to feed the scraper which runs in a tunnel above the slab. This type of installation is said to save about 8 ft. in height over silos of the same diameter and capacity using the customary methods of recovering the cement.

As in the self-unloading boats, which have been equipped with this system to handle bulk cement, the cement will not flood the tunnel to a height greater than the low doors controlling the flow. This makes it safe for a workman to enter the tunnel at any time without requiring additional height of tunnel to achieve this purpose. The silos, due to their unusual construction, are almost wholly self-cleaning and will eliminate most of the hand labor formerly necessary in cleaning them out. Provisions for air jets can be made if these are considered necessary.

The scraper is designed to run up a ramp and discharge to a hopper over the bag packers in the packing building. This hopper is large enough to insure a steady feed through control gates to the screens and packers allowing the screens to be operated at maximum capacity.

The length of haul is no serious factor as it is with present methods of reclaiming. Larger or smaller scrapers can be used in different installations to give equal capacities for different lengths of haul. Where there is more than one row of silos a separate scraper system can be installed under each row. This also allows two or more different kinds of cement to be handled at one time.

Among the advantages claimed for this system are: a higher reclaiming speed and a steadier flow of material; low power requirements; low maintenance cost largely due to the minimum number of wearing parts; simpler construction with single floor slab; reduction of height of silo for equal capacity and self-cleaning by gravity.



Plan and sectional views of the tunnel-scraper system adapted for the reclamation of cement from storage silos.

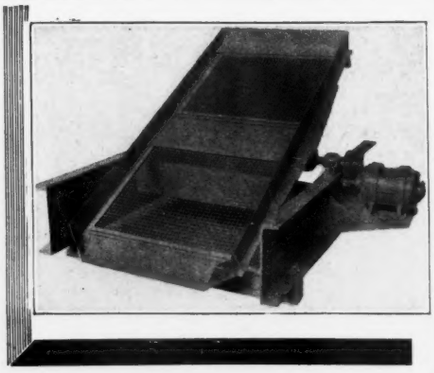
GREAT CRUSHING POWER

With the practical elimination of friction and vibration, and a tremendous power savings, the Wheeling Roller Bearing Crusher has firmly established itself as a leader to greater tonnage at a better profit.

Due to special toggle design, the Wheeling will produce better sized material with a minimum percentage of returns from the screen. Increased production, greater crushing power and lower costs almost insist that "Your Next Crusher Should Be a Wheeling."

WHEELING
MOLD & FOUNDRY CO.
WHEELING, W. VA.

A Good Screen Built Simply



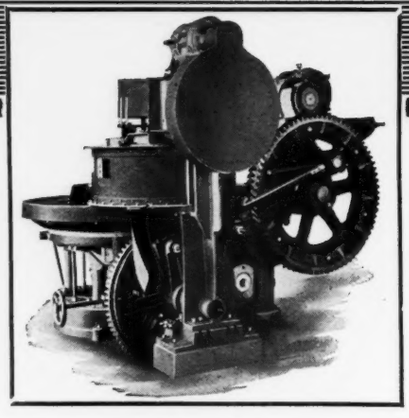
The McLanahan Shaking Screen is built to handle large capacities of Sand, Gravel, Limestone, Cinder, Clay, etc. It feeds and screens at the same time, shaking up and down and sidewise—eliminating any chance for material to lodge in screen openings.

No tappets, strips, oil cups, cams or electrical parts to work loose or get out of order. Dust-proof ball bearings assure minimum wear and power consumption. Single or double deck in various sizes.

Double Steel Log Washers, Scrubbers, Screens, Jigs, Elevators, Conveyors, Hoists, Dryers, etc., etc.

Send for Full Details

McLANAHAN & STONE MACHINE COMPANY
HOLLIDAYSBURG, PENNA.



We Make Complete Equipment for Sand-Lime Brick Plants

Send for Full Details

JACKSON & CHURCH
SAND LIME BRICK MACHINERY *Company* SAGINAW, MICH U. S. A.

It pays to buy A REAL HEAVY DUTY SHOVEL —with a reputation for reliability

Why take a chance — why penalize your production with a general-work shovel when you can get a heavy-duty machine that has proved its reliability in the toughest kind of digging?

Ruggedness and strength—for dependability at faster speed—are designed and built into Bucyrus-Erie mining shovels . . . Look at those rugged dipper sticks — and that sturdy box-girder boom! Dependable construction—throughout.

Every part built for reliable performance and lowest unit output cost, month after month! . . . Write us. We'll gladly furnish information to help you choose the machine you need.

* * *

Representatives throughout the U. S. A. Offices or distributors in all principal countries. *Branch Offices:* Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

A92-5-7-30-PQ

BUCYRUS-ERIE COMPANY, manufacturers of the only complete line — all sizes, types and powers.

BUCYRUS ERIE

Plants: South Milwaukee, Wis., Erie, Pa., Evansville, Ind. *General Offices:* South Milwaukee, Wis.